INTERNATIONAL STANDARD

ISO 8586

Second edition
2023-04

Sensory analysis — Selection and training of sensory assessors

Analyse sensorielle — Sélection et entraînement des sujets sensoriels

Reference number
ISO 8586:2023(E)

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Published in Switzerland

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Foreword

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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).

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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 34, *Food products*, Subcommittee SC 12, *Sensory analysis,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/SS C01, *Food Products,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 8586:2012), which has been technically revised.

The main changes are as follows:

— the Title has been changed to "Sensory analysis — Selection and training of sensory assessors" (the monitoring was removed as redundant with ISO 11132);

— some text from the Introduction has been moved into Clause 4;

— the Scope has been modified;

— a definition for the term "homogeneous" has been added in Clause 3;

— the process steps and roles of assessors have been clarified and the corresponding Figure 1 revised;

— Table 4 has been added with references to other International Standards;

— the tables and exercises for screening and training have been revised and modified;

— in Tables 3, 5, 9 and 11, examples for home and personal care products have been added;

— new annexes have been added with examples of screening and training activities;

— the concept of expert sensory assessors has been included in 8.5;

— Clause 2 and the Bibliography have been updated.

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.

Introduction

Sensory analysis is a science that is involved with the assessment of the organoleptic attributes of a product by the senses. As such, sensory analysis uses sensory assessors as evaluators of products. This document describes the recruitment, screening and training protocol for sensory assessors.

A sensory analysis sensory panel constitutes a true “measuring instrument”, and consequently the results of the analysis depend on its members.

The recruitment of persons willing to participate in a sensory panel therefore needs to be carried out with care and to be considered as a real investment, both in time and money.

Sensory analysis — Selection and training of sensory assessors

WARNING — This document does not address any safety issues associated with its use. It is the responsibility of the user of this document to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to use.

1 Scope

This document specifies criteria for the selection of and procedures for the training of trained sensory assessors and expert sensory assessors for food and beverages, as well as home and personal care products.

It is applicable to all industries concerned with the evaluation of products by the sense organs.

This document supplements the information given in ISO 6658.

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 5492, *Sensory analysis — Vocabulary*

ISO 6658, *Sensory analysis — Methodology — General guidance*

ISO 8589, *Sensory analysis — General guidance for the design of test rooms*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5492 and the following 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
sensory assessor
any person taking part in a sensory test

Note 1 to entry: A naive sensory assessor is a person who does not meet any particular criterion.

Note 2 to entry: An initiated sensory assessor has already participated in a sensory test.

3.2
screened sensory assessor
sensory assessors (3.1) who have been screened for their sensory abilities

3.3
trained sensory assessor
sensory assessors (3.1) who have been trained for a method or methods

3.4
expert
<in the general sense> person who, through knowledge or experience, has competence to give an opinion in the fields about which he/she is consulted

3.5
expert sensory assessor
sensory assessor (3.1) with a demonstrated sensory sensitivity and with considerable training and experience in sensory testing, who is able to make consistent and repeatable sensory assessments of various products

3.6
sensory panel training
series of *sessions* (3.11) in which *sensory assessors* (3.1) are oriented to the tasks to be completed by a *sensory panel* (3.7) and practice assessing particular product(s), which may include relevant product characteristics, standard rating scales, techniques of evaluation and terminology

3.7
sensory panel
group of *sensory assessors* (3.1) participating in a sensory test

3.8
repeatability
agreement in assessments of the same products under the same test conditions by the same *sensory assessor* (3.1) or *sensory panel* (3.7)

3.9
reproducibility
agreement in assessments of the same products under different test conditions or by different *sensory assessors* (3.1) or *sensory panels* (3.7)

Note 1 to entry: Reproducibility may be measured as any of the following:

— the reproducibility of a sensory panel (or an assessor) in the short term, measured between two or more *sessions* (3.11) separated by several days;

— the reproducibility of a sensory panel (or an assessor) in the medium or long term, measured among sessions separated by several months;

— the reproducibility between different sensory panels, in the same laboratory or in different laboratories.

3.10
homogeneous
of the same kind

3.11
session
period of time where the *sensory assessors* (3.1) work on a specific task or evaluate a number of samples, either individually or as a group

Note 1 to entry: A session typically spans from 30 min to 2 h.

4 Recruitment and preselection of subjects

4.1 General

4.1.1 Sensory assessment can be performed by four types of assessors (see Figure 1):

— naive sensory assessors;

— screened sensory assessors;

— trained sensory assessors;

— expert sensory assessors.

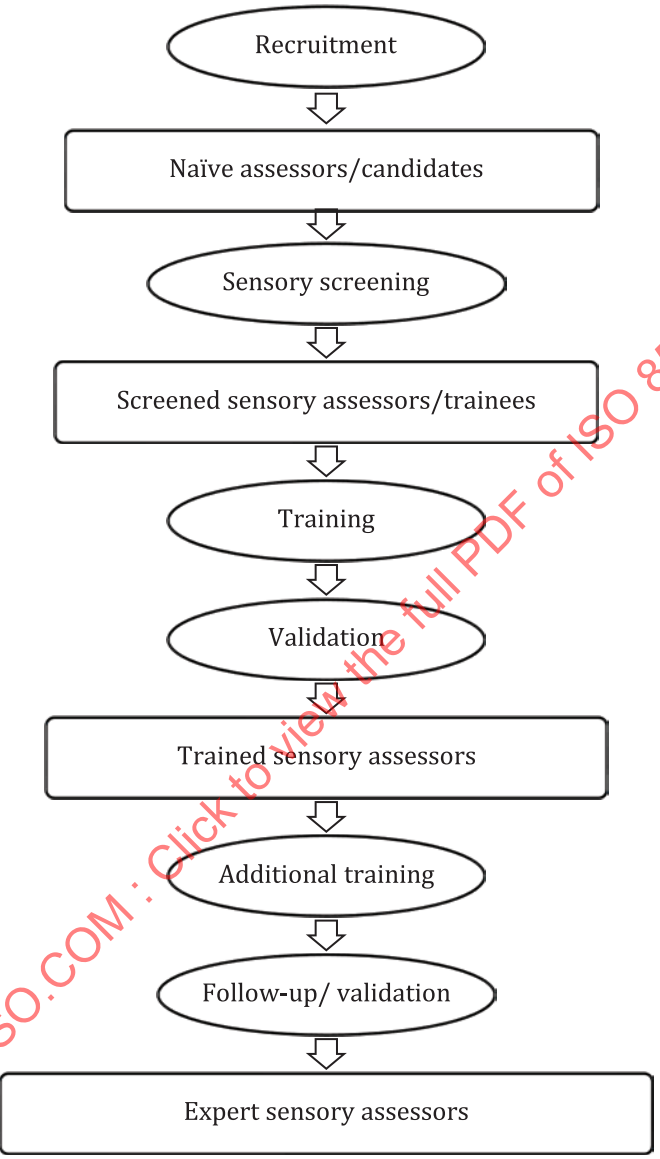

Figure 1 — Recruitment, screening and training process of sensory assessors

4.1.2 It is necessary to undertake a preliminary selection of the candidates at the recruitment stage, in order to eliminate those who would be unsuited for sensory analysis. The final selection shall be made after screening and ultimately training. The selection and training methods to be employed depend on the tasks intended for the "trained sensory assessors" and "expert sensory assessors".

4.1.3 Sensory assessors work as a sensory panel which is managed by a sensory panel leader. In certain cases (especially for descriptive sensory analysis), the sensory panel may be divided into specialized subgroups.

4.1.4 The recommended procedure for the training of a sensory panel involves:

a) recruitment and preliminary screening of naive assessors/candidates;

b) screening of naive assessors/candidates, selection of whom are to become screened sensory assessors/trainees;

c) training and validation of screened sensory assessors, selection of whom then become trained sensory assessors;

d) possible additional training of trained sensory assessors to become expert sensory assessors.

The exact procedures covered by a) and b) and the nature of the tests performed in c) and d) depend on the tasks intended for the sensory panel.

4.1.5 The sensory panel leader is responsible for the general follow-up of the group of expert sensory assessors and for their training. The expert sensory assessors are not responsible for the choice of tests used, the presentation of the samples or for the interpretation of results. These matters are the responsibility of the sensory panel leader who also decides how much information is given to the sensory panel.

4.1.6 The performance of selected assessors should be monitored regularly to ensure that the criteria by which they were initially selected continue to be met. For monitoring and validation procedures, see ISO 11132.

4.1.7 The entire process for the recruitment of a sensory panel is illustrated in Figure 1.

4.1.8 Willing candidates for training shall have the following general characteristics:

a) they shall be motivated and interested in further developing their sensory skills;

b) they shall be able to participate;

c) they shall not have any sensory impediments related to the purpose of the test.

4.2 Recruitment

4.2.1 General

To recruit candidates and to screen those most suitable for training, follow 4.2.2 to 5.7.

4.2.2 Recruitment conditions

There are three important considerations for the recruitment of people for a sensory panel:

— Where should people be recruited from to constitute the group?

— How many people shall be selected?

— How shall the people be selected?

Answers to these questions are provided in 4.2.3 to 4.2.5.

4.2.3 Types of recruitment

4.2.3.1 General

Two types of recruitment are available to organizations:

— company staff recruited from within the organization (internal recruitment);

— recruit people from outside the organization (external recruitment).

It is possible to constitute a mixed sensory panel from both types of recruitment.

4.2.3.2 Internal recruitment

Internal candidates are recruited from office, plant or laboratory staff. It is advisable to avoid those persons who are too personally involved with products or projects being examined, in particular those involved at the technical or commercial level, because they can cause the results to be biased.

In this type of recruitment, it is vital that the organization's general management and hierarchy provide their support and make it known that sensory analysis is considered as part of everyone's work. This can be made known at the hiring stage of the personnel.

4.2.3.3 External recruitment

The recruitment is conducted outside the organization.

The most commonly used means for this purpose are advertisement of the role, e.g. in local press, social media or through suitable clubs or groups.

4.2.4 Advantages and disadvantages of internal and external recruitment

4.2.4.1 General

Organizations may use independent internal or external sensory panels for different tasks.

4.2.4.2 Internal recruitment

4.2.4.2.1 Advantages

The advantages are:

— the people are available at short notice as they work on site;

— it is not necessary to make provision for any payment (however, in order to maintain interest, it can be desirable to offer incentives);

— a better confidentiality regarding the results is ensured, which is particularly important for research work.

4.2.4.2.2 Disadvantages

The disadvantages are:

— problems related to the hierarchy of the organization;

— candidates are influenced in their judgements by knowledge of the products;

— replacement of candidates is more difficult (limited number of persons in small organizations);

— less choice of people;

— lack of availability due to conflicting priorities.

4.2.4.3 External recruitment

4.2.4.3.1 Advantages

The advantages are:

— a wide range of choice;

— a subsequent supply of new potential assessors by word of mouth;

— no problems with hierarchy;

— easier selection, without the risk of offending people if they are unsuitable;

— candidate availability.

NOTE Since it is necessary that the individuals be available, a disproportionate number of retired or unemployed people or students are sometimes encountered because it is more difficult to recruit those in full-time employment.

4.2.4.3.2 Disadvantages

The disadvantages are:

— the method can be seen to be expensive (remuneration, paperwork);

— this method is better suited to urban communities where there is a sufficient number of inhabitants; in rural areas, it is not always easy to obtain sufficient suitable people in the area, but advantage can be taken of people associated with co-operatives (e.g. milk, wine), and in this case, the risk that some candidates are influenced in their judgement because of their experience shall be taken into account;

— after having paid for the selection and training, there is a risk that people leave at a moment's notice.

4.2.5 Number of persons to be selected

Experience has shown that, after the recruitment, the selection procedures eliminate approximately half or more of the people for reasons such as sensory ability, knowledge and aptitude.

The number of persons to be recruited varies depending on the following elements:

— the financial means and the requirements of the organization;

— the types and frequency of tests to be conducted.

As not everyone will pass the selection criteria, it can be necessary to interview and screen many more people than is actually required to constitute the final sensory panel, e.g. in order to obtain a sensory panel of 12 screened sensory assessors for a descriptive analysis sensory panel, as many as 70 or more people can be screened, and a minimum of 18 persons should be selected for training.

For specialized purposes and different types of sensory tests, a higher number of sensory assessors can be required.

4.3 Background information and preselection

4.3.1 Initial aspects

4.3.1.1 General

Background information on the candidates may be obtained by submitting them to a combination of clearly understood questionnaires coupled with interviews by persons experienced in sensory analysis. Aspects specified in 4.3.1.2 to 4.3.1.5 shall be explored.

4.3.1.2 Availability

Candidates shall be available to attend both training and subsequent assessments. Personnel who travel frequently or who have continual heavy workloads are often unsuited for sensory work.

4.3.1.3 Attitudes towards products to be assessed

Strong dislikes for certain foods and beverages, together with any cultural or other reasons for not consuming certain foods or beverages, should be determined. Candidates who are open-minded in their eating habits often make good sensory assessors for food or beverage descriptive analyses. If assessors are being recruited for a sensory panel that will assess home and personal care products, it will be an advantage if they are interested in the types of products being evaluated.

4.3.1.4 Knowledge and skills

The initial sensory perceptions of the candidates have to be interpreted and expressed, requiring certain physical and intellectual abilities, in particular the capacity to concentrate and to remain unaffected by external influences. If the candidate is then required to evaluate only one type of product, knowledge of all aspects of that product can be beneficial. It is then possible to choose sensory assessors from those candidates who have shown an aptitude for sensory analysis of this product for further training as expert sensory assessors.

4.3.1.5 Ability to communicate

The ability of candidates to communicate and describe the sensations they perceive during an assessment is particularly important when considering candidates for descriptive analyses. This ability can be determined at the interview and again during screening tests.

Desirable characteristics of candidates include the ability to:

a) describe products and verbalize sensations;

b) develop a memory for the description of sensory attributes.

4.3.2 Health and psychological criteria

4.3.2.1 Illness

Colds and temporary conditions should not be a reason for eliminating a candidate. Consider inviting them for screening at a later date.

4.3.2.2 General health

The candidates should be retained only if they can fully perform the necessary sensory evaluation tasks. They shall be willing and able to evaluate the full range of stimuli. They shall not have a condition (such as an allergy, sensitivity, food intolerance, or illness) which can cause adverse health effects as a result of performing these evaluations. They should not have a condition that impacts those senses relevant to the sensory tests to be undertaken. They shall not be taking medication which can impair

their sensory capacities and thus affect the reliability of their judgements. It can be useful to know whether the candidates have dental prostheses, since they can have an influence in certain types of evaluation involving texture or flavour of foodstuffs.

4.3.2.3 Psychological criteria

The following criteria are considered:

a) Interest and motivation: Candidates who are interested in sensory analysis and the product or products to be investigated are likely to be more motivated and hence are likely to become better assessors than those without such interest and motivation.

b) Sense of responsibility and ability to focus: Candidates shall show interest and motivation for the tasks and shall be willing to persevere with tasks demanding prolonged concentration. They shall be punctual in attending sessions and shall be reliable and honest in their approach.

c) Ability to judge: Candidates shall come to a decision, stand by it without any personal preferences, be self-critical and know their limitations.

d) Willingness to co-operate: Candidates should be willing to learn and not be dominant in a group discussion. This can be checked by running a mock sensory panel session as part of the screening process to ascertain how the candidates work in this environment.

4.3.3 Other factors

Other information which may be recorded during recruitment includes name, age group, sex, nationality, educational background, current occupation and experience in sensory analysis. Information on smoking habits may also be recorded, but candidates who smoke are not generally excluded, unless effects from smoking are influencing the candidate's or other sensory assessors' evaluations.

5 Sensory screening

5.1 General

Various tests which may be used for screening purposes are described in 5.2.

The choice of the tests and of the materials to be used is conducted on the basis of the applications planned and the properties to be assessed.

5.2 Types of screening tests

All the tests described have the dual function to establish the suitability of candidates for the intended sensory task(s) and to familiarize them with both the methods and products they will use if selected. There are three types, aimed at:

a) determining impairment;

b) determining sensory acuity;

c) evaluating a candidate's potential for describing and communicating sensory perceptions.

Screening should only be carried out after the candidates have received instructions on the evaluation procedure.

The tests should be conducted in an appropriate environment in accordance with the recommendations specified in ISO 8589. Several tests described in this document are based on those specified in ISO 6658.

The selection of candidates shall take into account the intended application, the performance of the candidates at the interviews, and their potential rather than their current performance.

5.3 Colour vision

Candidates with abnormal colour vision are unsuitable for tasks involving judgement or matching of colours. Assessment of colour vision can be carried out by using a recognized test, such as the Ishihara test[18] or the Farnsworth Munsell 100 hue test. The criteria are given in the producer instructions. For an alternative colour test using colorants, see Annex A.

5.4 Ageusia and anosmia

5.4.1 General

It is desirable that candidates be tested to determine their sensitivity to substances which can be present in small concentrations in products, in order to detect ageusia (see ISO 3972:2011), anosmia (see ISO 5496) or possible lack of sensitivity.

5.4.2 Ageusia

Samples of sapid materials (see Table 1 for examples) at well above threshold levels are prepared. Each sample is attributed a different, random, three-digit code number. Candidates are presented with one sample of each type (e.g. bitter, sweet) and are allowed to familiarize themselves with them. If the sensory panel will be working on products containing sweeteners, the sensory panel leader can include artificial sweeteners, or, if the sensory panel is going to be assessing beer, solutions of iso-alpha acids can be more pertinent than caffeine. The samples are then presented as a series of the same materials labelled with a different, random, three-digit code number. The candidates are asked to match each of the three-digit codes to one of the original labelled set (e.g. bitter, sweet) and to describe the sensation they are experiencing. Approximately twice as many new samples as original samples shall be presented. None of the samples shall be so intense as to produce strong carry-over effects and hence to influence subsequent tasting. Odourless flavourless water shall be made available for cleansing the palate between samples. Two replications of the test are recommended in order to avoid false results from random mistakes.

For these substances and concentrations, it is generally accepted that candidates who have more than 80 % correct matches may be chosen as trainees. However, for sensory panels where the detection and rating of basic tastes are critical (e.g. soft drink or alcoholic beverage sensory panels), there may be a requirement for 100 % correct matches.

Table 1 — Examples of taste and mouthfeel materials and concentrations for screening tests

Taste	Material	Chemical Abstracts Service (CAS) Registry Number©[1]	Concentration in water at room temperature g/l
Sweet	Sucrose [a)]	57-50-1	10 (1 %)
Acid	Citric acid anhydrous [b)]	77-92-9	0,6 (0,06 %)
Bitter	Caffeine [c)]	58-08-2	0,5 (0,05 %)
	Quinine HCl. $2H_2O$	6119-47-7	0,2 (0,02 %)
Salty	Sodium chloride	7647-14-5	2 (0,2 %)
Umami	Monosodium glutamate monohydrate	6106-04-3	0,6 (0,06 %)
Astringent	Tannic acid or quercetin or potassium aluminium sulfate (Alum)	1401-55-4 117-39-5 7784-24-9	1 (0,1 %) 0,5 (0,05 %) 0,5 (0,05 %)
Metallic	Iron(II) sulfate heptahydrate, $FeSO_4 \cdot 7H_2O$ [d)]	7782-63-0	0,01 (0,001 %)

The products used shall be free from impurities which can give interfering tastes. Taste perception can change depending on the water quality. It is advisable to use the same water source.

a) Sucrose solution is unstable. It should be used within 24 h and should be stored chilled until use.

b) Citric acid and caffeine have a better recognition in spring and demineralized water.

c) Caffeine should be dissolved in small amount of hot (80 °C) water prior to mixing with cold water.

d) Iron has to be dissolved only in demineralized water for recognition and to avoid oxidation and colouring. Colouration of the solution is a sign of oxidation. Coloured iron solution shall therefore not be used for investigating sensitivity of taste.

See ISO 3972:2011, Annex C.

[1] CAS Registry Number® is a trademark of CAS corporation. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

5.4.3 Odour recognition test

The objective is to establish if candidates have a broad experience of odours related to the product category of interest, and if they are able to identify and name odours correctly. Candidates are presented with one sample of each type and are asked to describe the odour (see Table 2). The number and range of odours presented is dependent on how important odour assessments are to the work the sensory panel is being screened for. Candidates are graded according to performance on a scale such as the following:

— 2 points for a correct identification or a description of the most frequent association;

— 1 point for a description in general terms or appropriate association;

— 0 points for no response or a wrong response.

In order to be chosen as trainees, it is generally accepted that candidates get, at minimum, one point for every odour tested. Two replications of the test are recommended in order to avoid false results from random mistakes.

Table 2 — Examples of odour materials and concentrations for screening tests

Odour	Material[b]	CAS No.	Concentration in ethanol[a] at room temperature g/l
Lemon, fresh	Citral ($C_{10}H_{16}O$)	5392-40-5	1×10^{-3}
Vanilla	Vanillin ($C_8H_8O_3$)	121-33-5	1×10^{-3}
Thyme	Thymol ($C_{10}H_{14}O$)	89-83-8	5×10^{-4}
Green, grassy	Hexanal ($C_6H_{12}O$)	66-25-1	5×10^{-4}

[a] Stock solutions are prepared with ethanol, but the final dilution is made with water and shall not contain more than 2 % volume fraction of alcohol.

[b] It is necessary to use products which are as pure as possible, since impurities can modify the nature and intensity of the odour.

NOTE 1 See 6.4.3.2 for other ways to prepare the samples. Refer to ISO 5496 for different sample preparation and presentation for odour recognition.

NOTE 2 The concentrations specified have been chosen after practical tests with all the substances given in the table using sensory panels of inexperienced sensory assessors. The concentrations chosen correspond to the recognition threshold of 70 % of the sensory assessors.

5.5 Texture

5.5.1 General

The purpose of this screening test is to determine whether candidates can differentiate among textures of different products.

Some examples of texture materials for screening tests are included in Table 3.

All test samples are to be presented to all candidates in the same randomized order (see Table 3 for examples). It is recommended that each set of samples be presented to the sensory assessors twice to check if sensory assessors can replicate their results. An explanation of each of the texture attributes should be given to the candidates prior to taking part in the tests in Table 3.

Different discriminative tests can be used, such as ranking, matching or paired comparison. In those cases, if the candidates think the samples are different, they can be asked to indicate what the difference is. This indicates if candidates can accurately identify texture differences among products.

Table 3 — Examples of texture materials for screening tests

Matching tests			
Powdery		Confectioner's sugar	
Chalky		Dry meringue	
Grainy		Semolina	
Fibrous		Asparagus, celery sticks	
Aerated		Chocolate mousse	
Crystalline		Granulated sugar	
Foam density		Foam from products such as shampoos or washing-up liquids, or foam created from one product with various amounts of water added	
Cream absorption		Different types of hand or face cream to rub into an area on the arm	
Fabric feel		Fabrics can be treated with different washing powders or fabric conditioners	
Sandpaper		Various grades of sandpaper can be matched or ranked	
Ranking tests[a]			
HARDNESS	**Reference product**	**Type**	**Sample size**
Soft ↓ Hard	Cream cheese or tofu/ soybean curd		1,25 cm cube
	Frankfurter sausages	Large, skinless	1,3 cm thick slice
	Olives, green	Giant size, stoned	1 olive
	Peanut	Roasted, salted (cocktail type peanuts)	1 whole nut
	Hard candy		
VISCOSITY	**Reference product**		**Sample size** (ml)
Low ↓ High	Water		2,5
	Light cream (18 % fat)		2,5
	Maple syrup		2,5
	Chocolate syrup		2,5
	Sweetened condensed milk (> 7,3 % fat, < 30 % water, > 27 % milk solids)		2,5

[a] See additional examples in ISO 11036.

5.5.2 Analysis and interpretation of results

Tabulate how many of the products were properly ranked or matched. Candidates should have at least 80 % of correct responses in matching tests and 60 % in ranking tests.

5.6 Hearing

Screening for hearing should be used if considered important for the sensory panel's work. Screening tests can, for example, include a task where a technician reads in a relatively low voice a paragraph and asks the sensory assessor to paraphrase this, or play back recordings at different levels in the form of a triangle test.

5.7 Descriptive ability

An example of a food product is presented to the candidates and the following question is asked:

> "You have been given a sample of [insert product name]. Please look at it, smell it, taste it and then write down as many words as you can to try and describe it, but without using words like good, nice, poor, bad, etc. Try and think of this exercise as having to describe what you sense to a friend who has never come across this product, so that they can imagine the same sensations."

A similar task can be used for prospective non-food sensory assessors: simply replace the relevant actions with the assessment method for the non-food product. For example, replace "taste" with "touch" for a face cream.

Give one point for every relevant descriptor and intensity modulator used. For this descriptive test, it is more important how the candidates compare, rather than the actual score that each candidate gets. In other words, invite the people with the highest descriptive scores to the sensory panel training, and reject those with the lowest scores.

5.8 Selection of trainees

A selection among candidates is made after the screening tests have been conducted. Criteria listed for each of the tests should be used in the selection of trainees.

In summary, the following factors should be considered when selecting sensory panel members/trainees:

a) motivation, enthusiasm, positive attitude;

b) good descriptive ability;

c) reliable sensory acuity;

d) good general health, no allergies to products;

e) ability to attend all training and evaluation sessions;

f) excellent communication skills (especially verbal);

g) ability to put forward an opinion when requested and listen to others' ideas with an open mind.

6 Training of sensory assessors

6.1 Principle

The purpose of training is to:

a) provide trainees with rudimentary knowledge of procedures used in sensory analysis and to develop their ability to detect, recognize, describe and discriminate sensory stimuli;

b) provide opportunities for trainees to use this expertise so that they can become proficient in the use of such abilities with particular products (see 6.5) or particular methods (see 6.6).

6.2 General

The number of trainees should be one-and-a-half to two times greater than that finally required in the sensory panel. To ensure the development of the correct approach to sensory analysis, all training shall be conducted in a suitable environment in accordance with the recommendation given in ISO 6658 and ISO 8589.

Trainees shall be instructed and trained to be objective and to disregard their likes and dislikes.

Results shall be discussed and sensory assessors shall be given the opportunity to reassess samples and to check their replies where disagreement exists.

Trainees shall be instructed not to use perfumed products prior to or during sessions. They shall also be asked to avoid contact with tobacco or with intensive tastes or odours for at least 60 min prior to sensory sessions. Soap used for washing shall not leave any odour on the hands. It shall be emphasized to trainees that if they carry any odour into the test room, tests can be invalidated.

Alteration of the appearance of a sample (e.g. by the use of coloured light) is particularly useful in demonstrating the need to be objective when trying to detect differences in other sensory characteristics.

Samples used for training and testing shall be characteristic of their origin, style and quality, and representative of the range generally found on the market. The samples used for training shall belong to the universe of sample that will be evaluated later. Samples shall be presented in the quantity and at the temperatures generally met within the trade or in use. Exceptions may be made when demonstrating excellence, imperfections or faults.

A single stimulus should initially be presented, but as experience is gained the single matrix may be replaced by actual foods or beverages.

It can be useful to train sensory assessors in basic knowledge of the products they assess, e.g. by giving information on the manufacturing process or by organizing visits to plants.

The sensory assessor shall learn to evaluate several samples during the same session, if this practice is relevant for the test to be carried out after training. The assessor also needs to learn to assess a wide range of samples of a product. Care shall be taken to ensure that sensory fatigue does not arise owing to the testing of an excessive number of samples.

Table 4 lists the appropriate subclauses within this document for sensory assessor training.

Table 4 — Guidelines for the selection of the appropriate training sections

Method	Training sections (this document)	Other sources
Discriminative: Unspecified descriptors (triangle test, duo trio, tetrad, etc.) Specified descriptors (2 AFC, 3 AFC, ranking, etc)	6.6.2, 6.5.2 6.4.1 6.4.2	ISO 4120 ISO 10399 ISO 5495 ISO 13301 ISO 8587
Descriptive: Qualitative Quantitative (consensus vocabulary, non-consensus vocabulary, absolute scales, relative scales, temporal methods)	6.4.1, 6.4.2 6.4.3 Clause 6, 6.5.3, 6.6.5	ISO 13299 ISO 4121
All methods	Clause 6	

6.3 Assessment procedure

At the start of any training programme, trainees shall be taught the correct way to make the assessments. In all assessments, instructions shall be read thoroughly before any task and adhered to throughout the analysis. Unless told to concentrate on specific attributes, the sensory assessors should usually examine:

— appearance;

— odour;

— texture;

— flavour;

— taste;

— aftertaste/afterfeel.

When assessing odour, trainees can be taught to take short rather than long sniffs and not to sniff too many times to avoid confusion and fatigue.

With both liquid and solid samples, the trainees can be told the procedure to be followed in advance, if it is possible. Adaptation and standard time intervals between samples as well as using an appropriate cleanser (see Annex C) should be included in the training. The interval between samples shall be sufficient to permit recovery, but not so long that trainees lose their ability to discriminate.

For non-food products, the method of assessment and the modality of interest is likely to be dictated by the product type and the objective of the test.

6.4 Training exercises

6.4.1 Tests for detection of a stimulus

These tests are based on the triangle test task in accordance with ISO 4120.

Examples of materials which may be used in detection tests are described in Table 5. In case of repeated training, the concentrations may be reduced.

One material at a time is tested. Two samples of the test material and one sample of water or other neutral medium, or one sample of the test material and two of water or other neutral medium, are presented to each trainee in the same order to ensure that comparisons of their performance are not influenced by the effects of different orders of presentation. In non-food sectors, other references and non-food bases can be used to demonstrate certain characteristics. The concentration of the test material shall be at the supra-threshold level.

The test materials, their concentrations and the neutral medium (if used) shall be chosen by the organizer in relation to the types of assessment for which the trainees are to be used. Preferably they should have 100 % correct responses after training.

An inability to detect differences after several repetitions indicates unsuitability for this type of test.

Table 5 — Examples of materials which may be used in detection tests

Modality	Material	CAS No./ compound	Property	Mass concentration or volume fraction in water at room temperature
Taste	Caffeine	58-08-2	Bitter	0,2 g/l
Taste	Citric acid	77-92-9	Sour	0,2 g/l
Taste	Sodium chloride	7647-14-5	Salty	1,3 g/l
Taste	Sucrose	57-50-1	Sweet	6 g/l
Taste	Monosodium glutamate	142-47-2	Umami	0,3 g/l
Flavour/aroma	Iron(II) sulfate heptahydrate	7782-63-0	Metallic	0,005 g/l
[a] Use odourless oils as solvent to prepare the solutions.				

Table 5 *(continued)*

Modality	Material	CAS No./ compound	Property	Mass concentration or volume fraction in water at room temperature
Flavour/aroma	(*Z*)-Hex-3-en-1-ol	928-96-1	Green, grassy, unripe	0,4 µl/l
Texture	Cosmetic Texture agent	Guar Gum	Stabilizing, thickening, filming	0,1 to 1 %
Texture	Cosmetic Hydrating agent	Hyaluronic acid	Moisturizing, softening	0,1 to 2 %
Aroma	Cosmetic Perfuming agent	Essential oils[a]	Perfuming, smell masking	0,1 to 1 %

[a] Use odourless oils as solvent to prepare the solutions.

6.4.2 Tests for discrimination between levels of intensity of a stimulus

These tests are based on the ranking test task in accordance with ISO 8587. The tests are carried out using stimuli for taste, odour, texture and appearance.

For each test, samples having different intensities of the property are presented in a random order to the trainees, who are required to put them in order of increasing intensity. This random order shall be the same for all trainees, to ensure that comparisons of their performance are not influenced by the effects of different orders of presentation. This sample order of presentation should only be applied in a training scenario. In a test situation, the guidelines of ISO 8587 should be followed.

A satisfactory level of success in this task can be specified only in relation to the particular intensities used.

Examples of products that may be used are given in Table 6. For ranking tests, trainees who invert the order of more than one adjacent pair of samples should be given further training.

Table 6 — Examples of products/items which may be used in discrimination tests

Test	Product/item[a]	Description	Mass concentration/ mass fraction in water at room temperature/ Examples
Taste discrimination Paired comparison or ranking	Citric acid	Sour	0,1 g/l; 0,2 g/l; 0,3 g/l; 0,5 g/l
Odour discrimination Paired comparison or ranking	Isoamyl acetate	Fruity	5 mg/l; 10 mg/l; 20 mg/l; 40 mg/l; ethanol dilution)
Trigeminal flavour discrimination Paired comparison	Sichuan pepper oleoresin	Pungency Spicy sensation[c]	0,11 g/l, 0,25 g/l, 0,35 g/l, 0,43 g/l

[a] Other appropriate products showing a graduation in characteristics may also be used to suit the industry concerned.

[b] See Reference [19].

[c] See Reference [20].

Table 6 *(continued)*

Test	Product/item[a]	Description	Mass concentration/ mass fraction in water at room temperature/ Examples
Texture discrimination Ranking	e.g. cream cheese, purée, gelatine	Creamy, hard, viscous, etc.	See Annex B
Appearance/colour discrimination Ranking	Paints, makeup, textiles	Colour, brightness, gloss, homogeneous	From matte to glossy, from pale to deep colour (Pantone colour)
Touch discrimination triangle test using an assessment box or screen	Textiles [b] cotton vs linen vs silk	Elasticity, softness, roughness	Pure or mixed raw materials
Odour discrimination Ranking Triangle test, paired comparison	Cream perfuming, off-odour recognition, deodorant	Intensity, agreement	Low to high intensity Finding the difference between two samples

[a] Other appropriate products showing a graduation in characteristics may also be used to suit the industry concerned.

[b] See Reference [19].

[c] See Reference [20].

6.4.3 Descriptive ability

6.4.3.1 General

Exercises are proposed to improve a trainee's ability to describe sensory perceptions. As an example, three exercises are described, covering odour, texture and flavour stimuli. During training sessions, the exercises can be combined and a discussion may follow the assessments.

The vocabulary selected permits the sensations to be described. Choosing the vocabulary requires a consensus of the group and it may be a function of the product targeted. In that way a glossary of terms or "attributes" can be created.

For many descriptive analysis methods these attributes have to be understood by all sensory assessors in the same way, to be independent of one another, to be singular, not redundant, non-hedonic, unambiguous, use one sense, unipolar, etc. Special measurement scales permit them to be quantified. This is achieved by a thorough definition of the attribute and, if suitable, a relevant qualitative reference.

6.4.3.2 Odour description test

Trainees are presented with 5 to 10 olfactory stimuli, preferably related to the product or products intended to be evaluated. The set shall contain some samples which are easy to recognize and others which are less common. The intensity shall be well above the recognition threshold, but not greatly above the levels that can be encountered in the products ultimately of interest.

Several methods of sample preparation exist which are either direct or retronasal in nature.

In direct methods, vials, bottles, smelling strips or capsules containing odours are employed.

In retronasal methods, the odours may be evaluated by ingestion of aqueous solutions.

The odour evaluation from flasks is described as follows:

— Samples are absorbed on odourless cotton wool, which is placed in odourless flasks, which do not provide a visual recognition of the colour and can be capped. Sufficient material shall be allowed to

evaporate into the headspace of the flasks and the intensity shall be checked before presentation of the flasks to trainees.

— Samples may also be presented on smelling strips or pads.

— Samples are presented one at a time, and trainees are asked to describe or record what is perceived. Following the initial reaction, the organizer may, if desired, discuss the sample in order to bring forth further comments and to explore more fully the trainees' capability of discussing the stimuli.

A satisfactory level of success in this task can be specified only in relation to the materials used. Examples of olfactory materials which may be used are given in Table 2 and 7. For more examples of olfactory materials, see ISO 5496.

Table 7 — Examples of olfactory materials for odour description test

Material	CAS No.	Name most commonly associated with the odour
Benzaldehyde	100-52-7	Bitter almonds, cherry
Octen-3-ol	3391-86-4	Mushroom
(*Z*)-Hex-3-en-1-ol	928-96-1	Fresh grass
(*S*)-(+)-Carvone	2244-16-8	Caraway
γ-Nonalactone	104-61-0	Coconut
Diacetyl	431-03-8	Butter
Cinnamaldehyde	104-55-2	Cinnamon
Phenyl acetate	122-79-2	Floral
Diallyl sulfide	2179-57-9	Garlic
Camphor	76-22-2	Camphor, medicine
Menthol	1490-04-6	Peppermint
Eugenol	97-53-0	Clove
Anethol	104-46-1	Aniseed
Vanillin	121-33-5	Vanilla
β-Ionone	79-77-6	Violets, raspberries
Butyric acid	107-92-6	Rancid butter
Acetic acid	64-19-7	Vinegar
Isoamyl acetate	123-92-2	Fruit, acid drops, banana, pear
Dimethylthiophene	638-02-8	Grilled onions
It is possible to use food products, spices, extracts, infusions or chemical odorants. Materials chosen shall be suited to local needs and shall be free from other odorous materials.		

6.4.3.3 Texture description test

Trainees are provided with a series of products in random order and are asked to describe their textural characteristics. This random order shall be the same for all trainees, to ensure that comparisons of their performance are not influenced by the effects of different orders of presentation.

A satisfactory level of success in this task can be specified only in relation to the products used. Examples of food and non-food products that may be used are given in Tables 8 and 9.

Table 8 — Examples of food products and their texture descriptors

Product	Example descriptors
Oranges	Juicy, cellular particles
Breakfast cereals (cornflakes)	Crispy, crunchy
Pears (Passe Crassane)	Gritty, juicy

Table 8 *(continued)*

Product	Example descriptors
Granulated sugar	Crystalline, coarse
Marshmallow topping	Sticky, malleable
Chestnut purée	Pasty
Semolina	Grainy
Double cream	Unctuous (fatty/oily), creamy
Edible gelatine	Gummy
Corn muffin or fruit cake	Crumbly
Cream toffee	Tacky, sticky
Calamari (squid)	Elastic, springy, rubbery
Celery	Fibrous
Raw carrots	Crunchy, hard

Table 9 — Examples of non-food products and their texture descriptors

Product	Example descriptors
Cream, lotion	Sticky, slippery, fluffy, oily, watery
Soap, shampoo	Foam quantity, firmness, aeration of foam
Textiles	Stiffness, roughness, fuzziness, hand friction, tensile strength[19]
Solid materials	Hard, soft, rough, smooth

6.4.3.4 Flavour descriptive test

Table 10 gives examples of materials which may be used during this phase of training. If possible, stimuli should be chosen to relate to the material or materials it is intended to assess.

Table 10 — Examples of materials for flavour descriptors

Example	Material	Example description
1	Table 3 materials	As provided
2	Table 5 products	As provided
3	Saccharin (100 mg/l)	Sweet
4	Quinine sulfate (0,20 g/l)	Bitter
5	Grapefruit juice	Bitter, astringent, grapefruit
6	Apple juice	Sweet, fruity, apple
7	Sloe juice	Sloe, bitter, astringent
8	Cold tea	Tea
9	Sucrose (10 g/l; 5 g/l; 1 g/l; 0,1 g/l)	Sweet
10	(*Z*)-Hex-3-en-1-ol (CAS No.: see Table 7) (130 µg/l) food grade	Grassy
11	Benzyl acetate (10 mg/l) food grade	Almond
12	Items 4 to 7 with varying sucrose contents (see item 9)	Intensity of sweetness
13	Tartaric acid (0,3 g/l) plus hexanol (30 mg/l), tartaric acid (0,7 g/l) plus hexanol (15 mg/l)	Intensity of astringency

Table 10 *(continued)*

Example	Material	Example description
14	Orange-flavoured drink coloured yellow; orange-flavoured drink coloured orange: lemon-flavoured drink coloured yellow; lemon-flavoured drink coloured orange	Orange and lemon
15	Succession of caffeine (0,8 g/l), tartaric acid (0,4 g/l), and sucrose (5 g/l)	Bitter, astringent, sweet
16	Succession of caffeine (0,8 g/l), sucrose (5 g/l), caffeine (1,6 g/l), and sucrose (1,5 g/l)	Bitter, sweet, bitter, sweet

6.4.3.5 Training on the development of vocabulary for descriptive tests (sensory profiles)

Trainees shall be introduced to the idea of profiling by being presented with a series of simple products and asked to develop vocabularies for describing their sensory characteristics, in particular terms which allow samples to be differentiated. Terms shall be developed individually and then discussed and an agreed list of at least 10 devised. This list shall then be used to produce profiles of the products, first by attributing the terms appropriate to each sample and then by scoring their intensities using the various types of scales discussed in 6.4.4. The terms shall be singular not composite (combinations of singular primary terms). Examples of composite terms are freshness, softness, greasy, creaminess. Examples of singular terms are sweet, sour, bitter, salty, umami, hard (texture) and smooth.

The test organizer shall produce profiles of the products using the results to illustrate the value of descriptive analysis to the trainees. Examples of products which may be used in this training exercise are commercial fruit juice and blends, breads, cheeses, fruit and vegetables.

Reference materials may be used when training trainees to develop vocabulary for descriptive tests. A reference is a material that demonstrates the attribute. For example, sucrose solution can be used as a reference for sweetness. See also Reference [21].

Other products may be selected to suit the application.

See also References, [22], [23] and [24].

6.4.4 Training in the use of scales

Depending the objective of the study and the product, trainees shall be introduced to the concepts of rating and/or classification and/or interval and/or ratio scales [see ISO 6658 (general guidance on scales), ISO 11036 (examples of references and scales in Appendix), ISO 13299 (different profiling methods), ASTM E3041 (selecting and using scales) ASTM E1909 (time intensity scales) and ISO 4121 (examples of scales for different sensory panel types)]. Various ranking and rating procedures can be used to attach meaningful magnitudes to the samples. The base can initially be water, but actual foods and beverages, with mixed stimuli, both of which can vary independently, may then be introduced. When training on the use of a scale for non-food products, it can be useful to start with simple products or their ingredients to demonstrate differences across the product type.

Examples of common scales can be found in Annex D and ISO 4121.

Training sensory assessors to use scales can be one of the most difficult tasks in the training programme and needs to be planned carefully. Experience has shown that starting with ranking tests helps build confidence in the trainees and allows them to progress to the specific method scale as they become more competent and capable. For methods that use an unstructured line scale, it can be easier for the trainees to start with a 10-point category scale and gradually move to the unstructured line scale.

Trainees shall be instructed on how the scale is to be used. This can vary for different scaling methods, but the majority of scales start from the left hand side at zero and finish at the right hand side with the highest level. Generally the scales will run from "'not" to "very", or the word anchors are adjusted to match the attribute title. It is not advisable to start a scale at "low" as this can cause issues when the

attribute is not present for some samples. Practice in using the scale is required to enable the trainees to produce reliable, good quality data.

The use of a simple scaling exercise in the initial scale training session, such as that shown in Annex E, can be beneficial to demonstrate the quantitative response scales used in many descriptive analysis methods. Blank line scales can also be given to the trainees for them to mark on the line where they think various semantics (e.g. slightly or moderate) are positioned.

Start product training on scales with one simple attribute. Basic tastes are a good choice for food sensory panels as solutions can be easily prepared and adjusted. For home and personal care products, simple initial tests can involve various grades of sandpaper, different types of fabrics, or products with known differences between samples, e.g. hair tresses or fabrics which have been treated in different ways.

Directly compared ranking and rating exercises can be helpful to demonstrate to the trainee assessors how to use a scale for descriptive analysis. Trainees are first asked to rank samples with a range of concentrations and then rate them. The trainees will be able to mark their own results if the test is conducted on paper (see Annex F). The test can be run and repeated with the same or differently coded samples for the ranking and rating parts, with the same set of samples but in a different order, and with different levels and different concentration ranges. The test can also be run as a matching task for rudimentary scale training.

For some descriptive analysis methods, it is the pattern of the trainees' ratings that is important and the discussion should focus on the rank order and discrimination, not where on the scale the trainee has rated (for more information, see ASTM STP 758:1981). For methods that involve working with quantitative and calibrated references, it is the actual score from each trainee assessor that is marked and the discussion should focus on agreement around scale use, as well as the rank order and discrimination.

Training can progress to scale use in comparison to a certain product or products (e.g. see Annex G). Experience has shown that this type of approach can be helpful in building up the trainee's ability to use the scale and their sensory memory. This test can be repeated with different levels and positions of standards to give the trainees practice in using scales.

Table 11 gives examples of materials which may be used during this phase of training.

If possible, stimuli shall be chosen to relate to the product or products it is intended to assess.

For validation of the training in the scale usage, see ISO 11132.

Table 11 — Examples of materials that may be used for training in the use of scales

Example	Material				
	Food examples				
1	Table 4 and Table 6				
2	Caffeine	0,15 g/l	0,22 g/l	0,34 g/l	0,51 g/l
3	Tartaric acid	0,05 g/l	0,15 g/l	0,4 g/l	0,7 g/l
4	Hexyl acetate	0,5 mg/l	5 mg/l	20 mg/l	50 mg/l
5	Cheeses, e.g. mature hard cheese such as Cheddar or Gruyère, ripened soft cheese such as Camembert				
6	Gelatine gels (see Table B.1)				
7	Lemon juice and diluted lemon juice		10 ml/l	50 ml/l	Undiluted
	NON-FOOD EXAMPLES: Skin care products — Texture Attributes				
1	Absorption (quick to slow)				
	Talcum powder or Kaolin[a]	Ethanol 95 %	Water	Glycerin	Gel or Hair mousse

[a] Kaolin is soft white clay, resulting from the natural decomposition of other clays or feldspar.

Table 11 *(continued)*

Example	Material				
2	Stickiness intensity (not sticky to very sticky)				
	Talcum powder or Kaolin[a]	Liquid paraffin	Solid paraffin	Glycerin	Lanolin
3	Spreadability (difficult to easy)				
	Lanolin	Lipstick bar	Shampoo	Silicone elastomer	Liquid paraffin
	For more examples, definitions and application techniques see ASTM 1490.				

[a] Kaolin is soft white clay, resulting from the natural decomposition of other clays or feldspar.

6.5 Specific product training

6.5.1 General

After basic training, trainees may undergo a period of product training. The exact nature of this depends on whether the sensory panel is being trained for discriminative or descriptive testing.

The training activities can require from 10 h to 20 h or more depending on the test objective, the product and the sensory method chosen.

The number of samples for evaluation during the training depends closely on the variability of the products which are to be assessed by the sensory panel. For trainees who are to assess one specific product type, several samples of this type of product should be presented. For descriptive analysis sensory panels which evaluate different products, experience should be gained with a wide range of suitable products. In both cases, these samples should be representative of those that will be assessed after training and should cover the product's sensory space.

6.5.2 Discrimination assessment

Samples similar to those that are intended to be assessed are presented to the trainees who evaluate them using one of the discrimination assessment procedures. (See ISO 6658 and the International Standards describing individual discriminative tests.)

6.5.3 Descriptive assessment

The number of samples for evaluation during the training depends closely on the variability of the products which are to be assessed by the sensory panel. For trainees who are to assess one specific product type, several samples of this type of product should be presented.

For descriptive analysis sensory panels which evaluate different products, experience should be gained with a wide range of suitable products.

NOTE During training, 10 to 15 samples of a type of a product can be presented.

Descriptors are generally proposed by the sensory assessors to describe the various sensory characteristics.

The organizer then leads a discussion to help the sensory panel to put similar descriptors into groups and to rationalize the vocabulary by selecting a single descriptor to replace each group of terms. The process is assisted by examining external standards and samples with particular characteristics.

The agreed descriptors are then incorporated into a score sheet. Several further samples are examined and the terminology is further improved. The meaning of intensity scales for each attribute shall be discussed and rationalized by reference to actual samples.

6.6 Particular methods training

6.6.1 Principle

Those trainees most appropriate for a given method are chosen to make up pools from which sensory panels of assessors for particular tests can be assembled.

Sensory assessors/trainees selected as appropriate for one purpose are not necessarily appropriate for another, and sensory assessors/trainees excluded for one purpose are not necessarily unsuitable for others.

6.6.2 Discrimination assessments

Trainees shall examine actual samples repeatedly. If the sensory panel is to be used for the detection of a particular characteristic, the ability to detect adulterated samples at decreasing concentrations can also be used as a training exercise. Trainees shall perform consistently and be able to differentiate correctly the samples presented. See also ISO 4120 for the setup and execution of triangle testing.

6.6.3 Ranking assessment

Trainees shall examine actual samples repeatedly. Trainees shall perform consistently and be able to rank correctly the samples presented. See also ISO 8587 for the setup and execution of ranking tests.

6.6.4 Rating and scoring

Trainees shall examine actual samples repeatedly, presented in random order, and, if possible, at more than one session. To determine the sensory assessor and sensory panel's performance, see ISO 11132.

6.6.5 Descriptive sensory analysis

6.6.5.1 General

The minimum training process to achieve the level of a trained sensory assessor is based on 6.4.1, 6.4.2, 6.4.3 and 6.4.4. The validation of the training (see Clause 7 for details) can be done at this stage, but it's recommended for descriptive analysis sensory panels to continue with the training as described in this subclause. One of the aims is to optimize the technical knowledge of the selected assessors by training and development of their sensory potential. Trainees should possess knowledge of the physiology of taste and smell.

Training is aimed at optimizing the sensory knowledge of the sensory assessors and especially at enabling them to remember the descriptors of the sensory profile, as well as acquiring the required qualities for producing sensory profiles (repeatability, consistency, discriminatory ability).

Sensory assessors are chosen for their skills and their aptitude to follow an intensive training in order to become expert sensory assessors.

Desirable characteristics of sensory assessors include:

a) a memory for sensory attributes;

b) an ability to communicate with other assessors;

c) an ability to verbalize descriptions of products.

6.6.5.2 Sensory memory

Sensory assessors need an above-average ability to keep sensory impressions in mind. The tests used to train a trained sensory assessor rely largely on short-term sensory memory, whereas long-term sensory

memory is essential for the expert sensory assessor. Characteristics noted in a current assessment can be related to an experience of earlier assessments.

NOTE The attributes assessed during a test are naturally related to the experiences acquired during training.

The tests used for training expert sensory assessors are aimed more at exploiting long-term memory.

6.6.5.3 Training in the use of vocabulary and scales

Training normally comprises two phases, as follows:

— The generation, the definition and the recognition of each descriptor, the objective of which is to identify the words which enable the description of the product or the object (either by means of an existing list or via descriptors generated by the group) and to associate them with the corresponding sensory perceptions, to define each of the descriptors on the basis of these sensory perceptions and to learn to identify its presence or absence in the product or object (see 6.4.3.5).

— The assessment of the intensity of each attribute, the objective of which is to learn to evaluate the intensity of each descriptor. For some descriptive analysis methods, the sensory assessors are also required to memorize intensity levels for each of the selected descriptors.

NOTE 1 Training can call upon group facilitation techniques by alternating both individual and collective exercises. This approach requires the assessors to make a great effort to concentrate and memorize under the guidance of the sensory panel leader or facilitator.

Training may initially consist of assessing samples having as a descriptor more or less pronounced intensities and in producing a classification based on this descriptor. Subsequently, the assessors learn to express the intensities in the form of notes by means of references or products or materials having different levels of intensity for a given descriptor.

NOTE 2 Discriminatory and matching tests can be used to highlight the different characteristics of the products and materials and/or to check whether the characteristics have been remembered and recognized.

If controls or reference samples (see ISO 5492:2008 for a definition of controls and reference samples) have been provided, candidates shall be tested for their ability to recognize, describe and rate them.

For particular assessments, despite being selected as the most suitable candidates, selected assessors can fluctuate in their performance during training. With descriptive analysis, it can often prove an advantage to select the better performers or to divide the assessors into subgroups following a programme of assessments and before additional training or any complex statistical examination of the data.

6.7 Practice

Practice is key to training good sensory assessors. Training activities shall be evaluated to analyse the evolution of sensory assessor performance. Additional practice for specific product training or particular methods training shall be conducted to help improve performance where required.

7 Validation of sensory panel performance and training effectiveness

Sensory panel leaders should evaluate the sensory panel and/or individual sensory assessor's responses, to validate their ability to become trained sensory assessors, over a period of time on the products concerned and for the particular methods used.

The evaluation of the performance of the sensory panel and individual sensory assessors depends on the methods used. For quantitative descriptive analysis, refer to ISO 11132.

Sensory assessors' responses shall be:

— repeatable;

— discriminative;

— homogeneous;

— reproducible.

Performance of the sensory assessors should be checked regularly. The purpose of checking performance is to determine whether the assessor is reliable, consistent and able to reproduce results. Results can also be used to motivate sensory assessors. Performance results determine whether more training is necessary. If a trainee's performance is acceptable, then that trainee will be considered a trained sensory assessor.

Any selected sensory assessors who show good repeatability, good acuity or particular aptitude regarding specific attributes (e.g. a taint) of classes of materials, should be considered for use on sensory panels of expert sensory assessors. The extent to which selected assessors possess these characteristics varies. A complementary selection can be performed or the training programme adjusted accordingly.

The analysis of the results obtained allows the assessment of the performance of the group as a whole as well as the individual performances of the sensory assessors.

Guidance on the performance checking procedures for quantitative descriptive sensory analysis is provided by ISO 11132. For other methods, see the corresponding International Standards given in Clause 6 and Table 4, and standards on other appropriate methods such as ISO 10399 and ISO 16820.

8 Management and follow-up of the group

8.1 Motivation

It is important to maintain the group's motivation:

— by providing information concerning how the results contributed to a successful outcome; be careful not to bias future work;

— by providing feedback concerning the individual results;

— by a reward.

8.2 Maintaining of skills

So that the group functions efficiently and does not lose the benefit of its training, it should be called upon on a regular basis. Weekly participation is desirable, and monthly participation should be a minimum. Moreover, it may be necessary to retrain the sensory assessors after long periods of interruption (>6 weeks).

It is highly recommended that verifications of the group's performances be conducted and documented, approximately twice a year. Ideally in order to assess the sensory panel reproducibility, the group should be benchmarked with respect to other groups by participating in intercomparison studies:

— participation in interlaboratory tests;

— comparison with respect to suppliers or subcontractors working on the same products.

When it is not possible to take part in an interlaboratory study, another way to check reproducibility is to repeat a specific study at planned intervals. Other approaches may also be used to meet this objective.

8.3 Renewal

It can be necessary to recruit new sensory assesors to the sensory panel because of unavoidable departures of certain group members (moving house, illness, etc.).

Specific training shall therefore be planned and implemented in order to bring the new trainees up to a satisfactory level of performance.

The process of integration into the group may be progressive, taking into account the ability of the new sensory assessors to give reliable responses.

8.4 Retraining

Retraining shall be done every time a new product or particular method is introduced or the sensory assessor has not been participating in evaluation sessions for a period of time.

If the nature of the products or materials changes, new training sessions shall be implemented in order to take account of possible new descriptors or of the modification of the intensity scales.

The specific sensory tests and products to be used depend on the application area of the sensory assessors. The screening tests can be repeated using products and evaluation methods that the sensory assessors normally use. These results can be monitored for each sensory assessor on a regular basis. The results should be presented to and discussed with the sensory assessors in a sensitive and unbiased way.

During the whole of the training process, the sensory panel leader should note how sensory panel members interact, whether there are any consistent outliers, the reliability of members and their general interest in the work. Sensory panel members having problems in these areas should be encouraged to overcome their difficulties or be removed from the sensory panel, if necessary.

8.5 Additional training

Additional qualities of experts in comparison to trained sensory assessors rests on their sensory memory and their accurate ability to perform sensory measures (same indicators of performance than for trained sensory assessors, but higher level of performance.

For some descriptive analysis methods, training for experts includes the assessment of the intensity and the memorization of their sensory perceptions, the objective of which is to learn to evaluate the intensity of each descriptor and to memorize intensity levels for each of the selected descriptors.

Expert sensory assessors shall:

— understand the role of sensory descriptors as an aid to developing long-term sensory memory, and also as a means of communicating with experts;

— acquire knowledge and command of the specific terminology used.

Annex A
(informative)

Alternative colour screening procedure

A.1 Reagents and materials

Use only reagents of recognized analytical grade, unless otherwise specified, and distilled or demineralized water or water of equivalent purity.

Yellow quinoline yellow (E 104; CAS No. 8004-92-0; CI 47005).

Blue patent blue V (E 131; CAS No. 3536-49-0; CI 42051).

Red carmoisine red (E 122; CAS No. 3567-69-9; CI 14720).

Graphite (CAS No. 7782-42-5) and cornstarch (CAS No. 9005-25-8).

A.2 Preparation of stock solutions and mixture

Prepare the test series out of two stock solutions. For the colour test series from yellow to green and blue, put 1 g quinoline yellow into a 500 ml volumetric flask and 0,1 g patent blue V in a 1 000 ml volumetric flask, make up to volume with water.

For the colour test series from red over violet to blue, weigh 1 g carmoisine red into a 1 000 ml volumetric flask and 0,1 g patent blue V into a 1 000 ml volumetric flask and make up to volume with water.

For the test with grey colour from light to dark, make a homogenous mixture from 90 % mass fraction cornstarch (native low water content) and 10 % mass fraction graphite.

A.3 Preparation of test solutions

For each of test samples 1 to 11, in a 100 ml volumetric flask, mix the volume(s) of stock solution(s), in millilitres, listed in Table A.1 with water, and transfer the solutions into a series of test tubes. Close the tubes.

Table A.1 — Volumes of stock solution (colour solution) in 100 ml dilutions

Colour solution volume ml	Sample no.										
	1	2	3	4	5	6	7	8	9	10	11
Yellow or red	25	23,5	21,5	19,0	16,5	12,5	7,0	3,5	1,5	0,5	0
Blue	0	1,5	3,5	6,0	8,5	12,5	18,0	21,5	23,5	24,5	25
NOTE Green = yellow + blue; violet = red + blue.											

For each of test samples 1 to 10, add the masses of cornstarch and graphite listed in Table A.2.

Table A.2 — Amount of stock mixture mixed with white cornstarch

Substance g	Sample no.									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Cornstarch	19,9	19,7	19,5	19,3	19,1	18,9	18,7	18,5	18,3	18,1
Graphite/cornstarch stock mixture	0,1	0,3	0,5	0,7	0,9	1,1	1,3	1,5	1,7	1,9

A.4 Procedure

The test tubes are presented in randomized order and have to be sorted from yellow through green to blue, or red through violet to blue, or from light to dark grey.

A.5 Minimum requirements

In every test series of 10 to 11 samples, two mistakes involving two adjacent samples are allowed.

This test can also be conducted by use of Farnsworth-Munsell 100 Hue Colour Vision test tiles or via any online version (see, for example, Reference [25]).

Annex B
(informative)

Recognition of difference in textures

Method: Ranking test in accordance with ISO 8587.

Test samples: Gelatine at different firmness levels (see Table B.1).

Substance: Gelatine Type A, 240 bloom, particle size 0,5 mm; sucrose; demineralized water; red food colour, mass concentration 5 g/500 ml).

Preparation: Weigh all ingredients into a pot to achieve the desired mass (which then should be recorded) and heat the content to 60 °C. Add water to return to the mass recorded before heating. Fill the solution into small containers of similar size and shape. Keep at room temperature for 4 h and in refrigerator for 24 h to harden the gelatine.

Application: Each trainee gets all samples in a randomized order and tests each encoded sample by touching, reordering the samples by firmness. If trainees do not manage to rank at least 80 % correctly, additional training sessions should be planned.

Table B.1 — Composition of the gelatine samples

Sample No.	Demineralized water ml	Sucrose g	Food colour g	Gelatine g
1	500	60	1,20	20,5
2	500	60	1,25	25,0
3	500	60	1,30	27,5
4	500	60	1,40	32,5
5	500	60	1,45	42,5
6	500	60	1,55	57,5
7	500	60	1,60	67,5
8	500	60	1,70	82,5
9	500	60	1,75	95,5
10	500	60	1,85	100,0

Annex C
(informative)

Cleansers and palate cleansers

A range of palate cleansers and considerations are listed in Table C.1.

Table C.1 — Cleansers and palate cleansers

Cleanser	Details/works with?
Resting and time	Everything. Resting the eyes can be important especially if staring at a device screen for extended periods.
Plain crackers or water biscuits	These are very popular as palate cleansers, along with water, for many foods and beverages.
Water	Sipping water between samples can help cleanse the palate. If the product being assessed is dissolved in water, as in the case of basic taste assessments, it's important to use the same water source for palate cleansing. Sparkling water can also be useful for greasy food.
Steaming water	Can be useful to rehydrate nostrils after gas chromatography-olfactometry.
Diluted lime juice	Lime juice at a concentration of around 10 % in water can be very useful for clearing grease from the mouth.
Warm water	Warm water can be effective in clearing grease from the mouth. Warm water can also be useful between assessments of very cold products like sorbets and ice creams.
Fudge	Fudge can be helpful for removing minty tastes and effects after the assessment of menthol, toothpaste and mouthwash.
Lemon juice in water	A solution of lemon juice in water can be useful for rinsing fingers when assessing greasy food but be careful it doesn't introduce lemon notes to the aroma or flavour profile.
Parsley	Parsley is an excellent garlic palate cleanser.
Bread and apple	Can be very useful for products that are oily, especially fish oil.
Cheese, yoghurt/milk, cucumber/apple, plain bread, crackers	These products can all be useful for spicy foods but beware the introduction of other tastes and effects. The best palate cleanser for spicy food is time. Other materials have been suggested in the literature[26].
Back of hand	It's said that smelling the back of your hand or the inside of your lower arm is a good cleanser for the assessment of fragrances or odours.
Leave the room	If the extraction system in the assessment area is not quite doing its job, or the assessments are being made in a local hall as part of a central location test, then leaving the room before assessing the next product can be helpful. This can be especially useful for the assessment of fragrances.
Creams	Creams or lotions applied to the skin can be notoriously difficult to cleanse. If possible, select different regions on the skin area for assessment rather than use a cleanser. A gentle fragrance-free soap can work, but recovery time from the soap and water will be needed before the next assessment.