
Graphical symbols — Test methods —
Part 1:
Methods for testing comprehensibility

Symboles graphiques — Méthodes d'essai —

Partie 1: Méthodes de vérification de la compréhensibilité



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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 9186-1 was prepared by Technical Committee ISO/TC 145, *Graphical symbols*, Subcommittee SC 1, *Public information symbols*.

This first edition of ISO 9186-1, together with ISO 9186-2, cancels and replaces ISO 9186:2001, which has been technically revised.

ISO 9186 consists of the following parts, under the general title *Graphical symbols — Test methods*:

- *Part 1: Methods for testing comprehensibility*
- *Part 2: Method for testing perceptual quality*

Introduction

The reason for the publication of this International Standard is the increasing use of non-verbal presentation of information in buildings and other places, and for services to the public.

Continued growth of international travel, tourism and trade requires graphical symbols to be understood. This part of ISO 9186 specifies methods for assessing the comprehensibility of graphical symbols.

ISO 9186-1 is intended to be used by all Technical Committees within ISO charged with developing specific graphical symbols for their industry, to ensure that there is only one symbol for each meaning. It is also intended to be used by any other organization concerned with establishing the comprehensibility of graphical symbols.

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Graphical symbols — Test methods —

Part 1: Methods for testing comprehensibility

1 Scope

This part of ISO 9186 specifies methods for testing the comprehensibility of graphical symbols. It includes:

- the method to be used in testing the extent to which a variant of a graphical symbol communicates its intended message; and
- the method to be used in testing which variant of a graphical symbol is judged the most comprehensible.

The purpose of this part of ISO 9186 is to ensure that graphical symbols, and signs using graphical symbols, are readily understood. The intention is to develop graphical symbols which are correctly understood by users when no supplementary (i.e. explanatory) text is presented. When such a graphical symbol cannot be obtained, it might be necessary to present a graphical symbol together with supplementary text explaining its meaning in the language of the intended users.

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.

ISO 9241-3, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 3: Visual display requirements*

ISO 9241-4, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 4: Keyboard requirements*

ISO 9241-5, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 5: Workstation layout and postural requirements*

ISO 9241-8, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 8: Requirements for displayed colours*

ISO 9241-12, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 12: Presentation of information*

ISO 17724, *Graphical symbols — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 17724 and the following apply.

3.1

comprehension test

procedure for quantifying the degree of understanding of a proposed graphical symbol

3.2

function

meaning of a referent which the symbol is intended to convey

3.3

judgement test

procedure for eliciting judgements of the comprehensibility of the proposed graphical symbol

NOTE In previous versions of ISO 9186, the judgement test was referred to as the “comprehensibility judgement test”.

3.4

referent

idea or object that a graphical symbol is intended to represent

4 Principle

Variants of referents are assessed for the ease with which they can be understood by carrying out one or two tests on them. In the comprehension test, each respondent is presented with one variant for any single referent and asked “What do you think this symbol means?” Each variant is scored in terms of the percentage of correct answers. In the judgement test, each participant is presented with all the variants being tested for a single referent and a statement of the intended meaning, and asked to estimate for each variant the percentage of the population that would be expected to understand the meaning. The judgement test results can be used to select variants for the comprehension test, which is normally not conducted on more than three variants for any one referent.

NOTE 1 When there are four or more variants for a single referent, the judgement test can be used to reduce the number of variants which might have to be tested using the comprehension test.

NOTE 2 The findings from the comprehensibility testing can be used by the submitter of the variants as supporting information which is required when variants are submitted for standardization.

NOTE 3 In some circumstances, the submitter of the variants might consider that the findings from the judgement test provide sufficient information and decide not to continue to the comprehension test.

NOTE 4 The submitter of the variants might intend to submit a variant as a proposal for standardization by organizations such as ISO, CEN, national or industry standards bodies. These organizations can require that testing for comprehensibility is conducted in a minimum number of countries, specify which test needs to be conducted and lay down the score which it is essential for a variant to obtain before it can be recommended as the most acceptable one for that referent.

NOTE 5 This part of ISO 9186 refers to testing using printed or screen presentations of the materials. Tests may be conducted using the internet, but only under supervised conditions to ensure that the test is administered as specified in this part of ISO 9186 and particularly, that respondents work alone and enter their personal details and responses correctly.

5 Pre-test information

The submitter of the referents and variants shall provide information which includes the following:

- a) the number of variants for each test;
- b) the name and contact details of the organization to which the test findings are to be submitted;

- c) details of the information that is required from the submitter by that organization;
- d) a completed application form for each variant of a referent as required by the standards organization. Where the standards organization does not have a specified application form for the submission of graphical symbols or safety signs for standardization, the submitter shall complete an application form for each variant.

NOTE 1 Application forms for submission of public information symbols for standardization by ISO/TC 145/SC 1 are available on www.iso.org/tc145/sc1 or from the ISO/TC 145/SC 1 Secretary. Application forms for submission of safety signs for standardization by ISO/TC 145/SC 2 are available on www.iso.org/tc145/sc2 or from the ISO/TC 145/SC 2 Secretary.

- e) any additional information on the meaning of the referent, acceptable answers to the comprehension test, context of use;
- f) confirmation that the proposed graphical symbol or safety sign has been designed in accordance with the relevant design principles and design criteria;

NOTE 2 Design principles and design criteria for public information symbols for standardization in ISO 7001 are specified in ISO 22727; design principles and design criteria for safety signs for standardization in ISO 7010 are specified in ISO 3864-1 and ISO 3864-3.

- g) an eps (or tiff) computer file for each variant as required by the standards organization;
- h) how many countries the testing is to be conducted in;
- i) whether findings from the judgement test or comprehension test or both is required by the standards organization.

NOTE 3 The Secretary to the relevant standards committee can provide necessary information relevant to (f), (g) (h) and (i).

It is recommended that three is the maximum number of variants for any one referent in the comprehension test. Although the judgement and comprehension tests are applicable to cases where only one variant is tested, a standards organization can require a minimum number of variants for a single referent to be tested in either test.

Where the tests are to be conducted in a number of countries, the submitter shall provide the same necessary information and material to the test administrators involved. If printed materials are used, it is necessary to ensure that all graphical materials are of the same standard and are prepared as one production batch. If a computer screen presentation is used, it is necessary to ensure that all pages are of the same standard. They shall be prepared at one programming site and the programs and files then made available to the test administrators in the format that they need.

6 Comprehension test

6.1 General

Carry out the tests using either a printed presentation or a computer screen presentation, depending on which is most practicable.

NOTE For the description of the tests using a computer screen presentation, the word "page" is used for a predefined presentation of text and/or graphic elements and their layout on a computer screen.

For a screen presentation, use a screen size of at least 380 mm when measured on the diagonal, with minimum resolution of 800 pixels × 600 pixels to ensure that the graphical symbol images presented are not distorted and that a sufficient number of graphical symbol variants can be displayed simultaneously. If the graphical symbol images presented show jagged lines or curves to the extent that the symbol image or image elements cannot be correctly interpreted, apply anti-aliasing methods or increase the minimum screen resolution to improve the quality of the image.

6.2 Preparation of test material

6.2.1 Variants should be black on white. Colour should only be used if colour is used for coding information, for example, when safety graphical symbols are being tested. If a coloured variant is used, ensure that the contrast between the figure and ground is sufficient for the variant to be readily visible, and that the colours and contrast levels are reproduced accurately in the materials presented to respondents.

Print one variant for one referent on one single test sheet (size A5 or larger) or display it on one test screen page.

In the comprehension test, it is important to inform the respondents in words or pictorial form of the general context in which they would expect to see the symbol. Present this information adjacent to the graphical symbol on each test sheet or screen page.

NOTE Context can be provided in words by using a phrase such as “at an airport”, “on the wall of a public building” or it can be provided in pictorial form by presenting a photograph showing a sign, in its actual location, bearing the graphical symbol.

6.2.2 For each respondent, provide an instruction sheet, a respondent self-report sheet and an example sheet written in the language of the respondent.

On the instruction sheet, instruct the respondent to write down, on the line below the graphical symbol on each test page or screen, his/her answer to the question: “What do you think this symbol means?” Instruct the respondent to write the response “Don't know” if he/she is unable to assign a meaning to the symbol. If the referents to be tested require some specific action when encountering the graphical symbol, also instruct the respondent to write down, in the second space below the symbol, his/her answer to the question: “What action would you take in response to this symbol?”

NOTE 1 When coloured symbols are being tested and the colours incorporate a system of encoding information, this system can be explained on the instruction page.

An example of the explanation of a system of using colour to encode information is given below.

- Symbols on a yellow background are warning symbols.
- Symbols on a green background indicate a safety message.
- Symbols on a blue background indicate an instruction.
- Symbols within a red ring and diagonal bar indicate prohibited actions.

With a screen presentation, ask respondents not familiar with the use of a personal computer to read the instructions out loud and to provide an oral answer to the question on each test page. Tell the person conducting the test to enter the answer on the computer page and have the text entered verified by the respondent. Obtain the consent of the respondent to this procedure.

On the respondent's self-report sheet, provide spaces for entering:

- the date of the test session;
- the name of the person conducting the test;
- the respondent's age according to the following age groups:
 - 1) between 15 and 30;
 - 2) between 31 and 50;
 - 3) over 50;
- the respondent's sex;

- the respondent's educational level;
- the respondent's ethnic or cultural background;
- whether they are disabled and, if so, whether the disability involves problems with physical mobility, with hearing or with seeing. Respondents can indicate they are disabled in more than one attribute.

NOTE 2 In asking respondents to indicate their educational level, the aim is to distinguish between

- those who left school at the minimum school-leaving age;
- those who have a post-school qualification which is not degree-level;
- those with a university degree or its equivalent.

The wording of the particular alternatives will vary according to the customs of the country in which the test is conducted and respondents should be offered alternative responses which fit those customs.

On the example page, show a commonly known graphical symbol. Above the graphical symbol, in conspicuous lettering (e.g. bold and large), show the word "Example". Below this word display the text or picture informing the respondents of the context in which they would expect to see the graphical symbol. In the box below the graphical symbol, have the meaning already entered. If referents that require some specific action when encountering the graphical symbol are tested, present, on the example page in the second box below the graphical symbol, the actions that should be taken.

With a screen presentation, at the bottom of the example page display the text: "With the next page the session will start. The session consists of ... pages. If you are at any time in doubt about what to do, go back to the instruction page by using the "previous page" button repeatedly." (Enter the number of pages in the space shown in the second sentence.)

NOTE 3 An example of printed booklet test material is given in A.1 to A.4.

6.2.3 Make a set of printed test sheets or test screen pages for each referent. On each sheet or screen page, show one of the graphical symbol variants to be tested and below it a line for the subject's response. Position the symbol in the centre of the sheet or screen. Except where the graphical symbol in actual use is likely to be presented less than 28 mm on its longest dimension, for printed presentation print the variant within a square not less than 28 mm × 28 mm such that the graphical symbol fills the square. For a screen presentation, the dimensions of a square enclosing the graphical symbol should be not less than 28 mm × 28 mm. When the graphical symbol is likely in use to be presented less than 28 mm on its longest dimension, the variants presented in the test should be the same size as the symbol in actual use.

NOTE For referents requiring some specific action when encountering the symbol, judging the responses can be improved by asking the following additional question: "What action would you take in response to this symbol?" In this case, both questions are to be presented in the space below the graphical symbol in such a way that if printed presentation is used, enough room is available for writing down the answers or, if a screen presentation is used, a rectangular box is provided which is intended for the respondent's response and which offers space for four lines of text with at least 50 characters per line.

6.2.4 Allocate the different variants of all referents to different test sets, which can contain a number of different referents but shall contain only one variant of a given referent. Ensure the number of referents in any given test set does not exceed 15.

NOTE The number of sets is determined by the maximum number of variants for a referent. If the number of variants per referent varies, the sets do not necessarily contain the same number of test sheets or pages.

6.2.5 When using printed materials, collate each test set into a booklet. Arrange the graphical symbols in the test booklet randomly. For each 50 booklets, use at least 10 different random orders of symbols, i.e. no more than 5 booklets in 50 shall have the same order of presentation.

With a screen presentation, present the test pages in a different random order for each respondent.

6.2.6 When a screen presentation is used, ensure the workstation layout, the visual display and the keyboard are in the positions recommended in ISO 9241-3, ISO 9241-4, ISO 9241-5, ISO 9241-8 and ISO 9241-12.

6.2.7 Assign each test set a code letter A, B, C, etc. With printed presentation, assign a number to each booklet in the set and print the code letter and booklet number on the first sheet of each booklet. With a screen presentation, assign each test page a unique code consisting of a code letter for the set and a code number for the respondent.

6.3 Respondents

6.3.1 Conduct the comprehension test in the number of countries decided by the submitter.

When the test is carried out in more than one country, whenever possible, the countries should be chosen to represent different cultural backgrounds, for example, one European country and one Asian country.

6.3.2 To test a set of variants for a given referent, use at least 50 respondents in each country. Do not use any respondents who have taken part in one test (judgement or comprehension) for any referent in any other test on that same referent.

6.3.3 Check that the respondents are people who can be expected to be familiar with the referent.

The respondents should form a representative sample of the eventual user population in terms of age, sex, educational level, cultural or ethnic background and (when relevant) physical ability. Particular attention should be paid to the inclusion of vulnerable sectors of the population when testing graphical symbols to be used in a safety context. The information collected from the respondents allows a judgement to be made concerning whether the sample is representative of the eventual user population.

6.3.4 Ensure that the groups that are presented with each set of materials are similar to each other in age, sex, occupation and general academic achievement by forming matched groups or by randomly allocating the sets of materials to individuals in the total sample of respondents.

6.4 Respondents' task in the comprehension test

Present a single test booklet or set of screen pages to each test respondent.

Tell the respondent to follow the instructions given on the instruction sheet. Tell the respondents to carry out the test in silence and not confer with anyone while they are doing it. Confirm that all respondents say that they understand their task.

6.5 Analysis of the results of the comprehension test

For every variant for each referent, produce a list of all responses generated.

As the list of responses can be used to resolve any anomalies in the results from different countries, keep it available.

NOTE It also provides information which may be useful for improving the design of the graphical symbol.

6.6 Categorizing the results

In each country, appoint a response-categorizer, who has not been one of the test respondents and is not the submitter, to assign each response on the list to one of the five standard categories 1, 2a, 2b, 3 or 4 shown in Table 1. Categorize responses in categories 2a and 2b as "wrong" (category 2), but list separately those that indicate an interpretation opposite to that intended and record their frequency separately.

NOTE 1 Category 2b responses are counted and listed separately because they are particularly important if the graphical symbol has relevance to safety situations.

Table 1 — Categorization of responses

Category	Meaning
1	Correct
2a	Wrong
2b	Wrong and the response given is the opposite of the intended meaning
3	The response given is "Don't know"
4	No response is given

Provide the response-categorizer with the graphical symbols which were tested and with examples of likely responses from categories 1, 2a and 2b with the category to which they are to be assigned.

Where the respondent has made no response at all on a given page of the booklet, the response-categorizer shall categorize this "response" as "No response is given".

"No response is given" shall be distinguished from cases where the respondent has indicated by a question mark, a dash, a cross, or any other sign on the page, that he/she does not know the meaning of the graphical symbol. Such responses shall be categorized as "Don't know".

NOTE 2 Different response-categorizers can be used for different referents.

6.7 Analyzing the categorization of responses

Tabulate the results for each country that participated in the test in a matrix as shown in A.5, so that there are three columns for each variant and one row for each category of response: 1 Correct, 2 Wrong, 3 The response given is "Don't know", 4 No response is given.

For each variant, count the number of responses in each category for each country separately and enter them in the column headed "f" (frequency).

Convert the frequencies thus obtained into percentage values by dividing them by the total number of responses in categories 1 to 3 given to that variant, and then multiplying by 100. Enter the percentages in the column headed "%". Complete the column headed "cum %" (cumulative percent) by inserting the cumulative percentage values.

For each variant, provide a separate row for responses that were categorized as 2b "Wrong and the response given is the opposite of the intended meaning". For each variant, count the number of responses in this category for each country separately and enter the number in the column headed "f" (frequency). Convert this frequency into a percentage of the total number of responses in categories 1 to 3 by dividing it by the total number of responses in categories 1 to 3 given to that variant, and then multiplying by 100. Enter the percentage in the column headed "%".

6.8 Presentation of results

Present the results for each referent in a form, such as that shown in A.5, giving all the variants for one referent in a single form. On the form for each referent, include the following information:

NOTE The form shown in A.5 is available on www.iso.org/tc145/sc1.

- a) the referent;
- b) the year and month of the comprehension test;
- c) the function of the referent;

- d) the field(s) of application;
- e) the intended user group specified in the instructions to respondents;
- f) the country in which the test was conducted;
- g) the number of respondents in each age group (15 to 30, 31 to 50, over 50);
- h) the number of respondents of each sex;
- i) the number of respondents in each educational category;
- j) the number of respondents who report themselves to be disabled;
- k) copies of the graphical symbol variants tested in the colours in which they were presented;
- l) the context information presented when the variants were tested;
- m) for each variant, a verbal statement of the colour in which it was presented;
- n) the dimensions (height and width) of the image as tested, expressed in millimetres;
- o) the source of each variant;
- p) the sample size (number of respondents for each variant who gave a response);
- q) the frequency of responses in each category for each variant;
- r) the percentage of responses in each of categories 1 to 3 for each variant;
- s) the cumulative percentage of responses in categories 1 to 3 for each variant;
- t) the frequency and percentage of responses in category 2b for each variant;
- u) for each variant, a list of the five most frequent responses given in each of the response categories 1, 2a and 2b showing the category into which each response was put and the number of respondents who gave that response;
- v) the name and contact address of the test administrator or response categorizer.

6.9 Combination of the results from different countries

Take the data from all of the countries that participated in the comprehension test. Calculate for each individual variant and for each response category (1, 2 and 3) the total frequency of responses from all participating countries and convert these frequencies into percentage values by dividing them by the total number of responses in categories 1 to 3. Complete the column headed "cum %" (cumulative percentage) using the percentages for all respondents.

Complete a form (see the example in A.6) for each referent, showing the comprehension data from all countries that participated in the comprehension test. Include on these forms the following information:

NOTE The form shown in A.6 is available on www.iso.org/tc145/sc1.

- a) the referent;
- b) the year and month of the comprehension test;
- c) the function of the referent;

- d) the field(s) of application;
- e) the intended user group specified in the instructions to respondents;
- f) the countries in which the test was conducted;
- g) the number of respondents in each age group (15 to 30, 31 to 50, over 50);
- h) the number of respondents of each sex;
- i) the number of respondents in each educational category;
- j) the number of respondents who report themselves to be disabled;
- k) copies of the graphical symbol variants tested in the colours in which they were presented;
- l) the context information presented when the variants were tested;
- m) for each variant, a verbal statement of the colour in which it was presented;
- n) the dimensions (height and width) of the image as tested, expressed in millimetres;
- o) the source of each variant;
- p) the sample size (number of respondents for each variant who gave a response);
- q) the frequency of responses in each category for each variant;
- r) the percentage of responses in each of categories 1 to 3 for each variant;
- s) the cumulative percentage of responses in categories 1 to 3 for each variant;
- t) the frequency and percentage of responses in category 2b for each variant;
- u) the name and contact address of the test administrator or response categorizer in each country.

6.10 Determination of the most comprehensible variant

Consider the combined data from all participating countries. The variant with the highest percentage in response category 1 is the most comprehensible variant.

7 Judgement test

7.1 General

Carry out the test using either a printed presentation or a computer screen presentation, depending on which is most practicable.

NOTE 1 For the description of the tests using a computer screen presentation, the word “page” is used for a predefined presentation of text and/or graphic elements and their layout on a computer screen.

With a screen presentation, present the symbol images separated from the background by a square enclosure, or other shape if the symbol is in a safety geometric shape, for example, a triangle or circle. Present safety signs in their specified geometric shape and colours.

NOTE 2 The instructions concerning mode and quality of presentation given in 6.1 also apply to the judgement test.

7.2 Preparation of test material

7.2.1 Variants should be black on white. Colour should only be used if colour is used for coding information, for example, when safety graphical symbols are being tested. If a coloured variant is used, ensure that the contrast between the figure and the ground is sufficient for the variant to be readily visible, and that the colours and contrast levels are reproduced accurately in the materials presented to respondents.

Print the variants for one referent on one single white sheet or present them on one screen page which has a white background. Variants for a number of referents, up to a maximum of 15, can be included in one test. With a printed presentation, group the test pages (one for each referent) into booklets. Provide each respondent with a booklet containing a copy of the test page(s) showing the variants.

Inform the respondents in words or pictorial form of the general context in which they would expect to see the symbol. Present this information below the graphical symbols on each test sheet or screen page.

NOTE Context can be provided in words by using a phrase such as “at an airport”, “on the wall of a public building” or it can be provided in pictorial form by presenting a photograph showing a sign, in its actual location, bearing the graphical symbol.

7.2.2 With a printed presentation, begin each test booklet with two pages: the instruction page and the respondent detail page. The instruction page shall inform the respondents that they are to be presented with a set or sets of graphical symbols and a statement of their intended meaning, and shall inform them of their task (see 7.4).

NOTE 1 When coloured symbols are being tested and the colours incorporate a system of encoding information, this system can be explained on the instruction page.

An example of the explanation of a system of using colour to encode information is given below.

- Symbols on a yellow background are warning symbols.
- Symbols on a green background indicate a safety message.
- Symbols on a blue background indicate an instruction.
- Symbols within a red ring and diagonal bar indicate prohibited actions.

On the respondent's detail page, provide spaces for entering:

- the date of the test session;
- the name of the person conducting the test;
- the respondent's age according to the following age groups:
 - 1) between 15 and 30;
 - 2) between 31 and 50;
 - 3) over 50;
- the respondent's sex;
- the respondent's educational level;
- the respondent's ethnic or cultural background;
- whether they are disabled and, if so, whether the disablement involves problems with physical mobility, with hearing, with seeing. Respondents can indicate whether they are disabled in more than one attribute.

NOTE 2 In asking respondents to indicate their educational level, the aim is to distinguish between

- those who left school at the minimum school-leaving age;
- those who have a post-school qualification which is not degree-level;
- those with a university degree or its equivalent.

The wording of the particular alternatives will vary according to the customs of the country in which the test is conducted and respondents should be offered alternative responses which fit those customs.

With a screen presentation, begin each set of test pages with two pages: the instruction page and the respondent detail page as described for a printed presentation. Provide each test page with a “next page” and a “previous page” button so that the respondent can move from one page to the other by using the cursor keys or mouse.

7.2.3 When using printed material, print all the variants for one referent on the test page, a sheet of paper of size A4 or similar. Except where the graphical symbol in actual use is likely to be presented less than 28 mm on its longest dimension, print each variant within a square not less than 28 mm × 28 mm such that the graphical symbol fills the square. When the graphical symbol is likely in use to be presented less than 28 mm on its longest dimension, present the variants in the test at the same size as the symbol in actual use. Position the variants equally spaced around the circumference of a circle with a radius of 80 mm which has its centre at the centre of the sheet. Draw a line for the response under each variant. On the test page, state the name of the referent, its function, its field(s) of application and any excluded functions.

NOTE 1 This information can be extracted from the completed form for testing and standardization of a graphical symbol.

NOTE 2 An example of a printed test page is shown in B.1.

When using a screen presentation, present all the variants for each referent on one test page. On this test page, present a maximum of 12 graphical symbols sufficiently large for all details to be distinguishable. Ensure that the size of the enclosure of a graphical symbol is not less than 28 mm, with a minimum of 60 pixels. Position the graphical symbols equally spaced around the circumference of a circle (white on white) with a radius of 80 mm, which has its centre coinciding with the centre of the screen. When required, the circle can be elongated into an ellipse to better accommodate symbol variants. Keep the small axis of the ellipse at 160 mm. In the middle of the test page, state the name of the referent, its function, its field(s) of application and any excluded functions. Define a rectangular data-entry field under each graphical symbol. Show a horizontal line at the bottom of this field with a percentage (%) sign at the right-hand end of the data-entry field. Ensure that it is possible to position the cursor in the data-entry field (in front of the % sign) to key in the response. Provide feedback to identify the data-entry field selected as well as the corresponding graphical symbol (e.g. by highlighting both elements).

7.2.4 With either a print or a screen presentation, the variants for a number of different referents (up to a maximum of 15) can be tested on each group of respondents. Use a separate sheet or page for the set of variants for each referent. When more than one referent is tested, use at least 10 different random orders of the referents or as many different random orders as possible for each 50 respondents.

7.3 Respondents

7.3.1 Conduct the judgement test in the number of countries decided by the submitter.

When the test is carried out in more than one country, whenever possible, the countries should be chosen to represent different cultural backgrounds, for example, one European country and one Asian country.

7.3.2 To test a set of variants for a given referent, use at least 50 respondents in each country. Do not use any respondents who have taken part in one test (judgement or comprehension) for any referent in any other test on that same referent.

7.3.3 Check that the respondents are people who can be expected to be familiar with the referent.

The respondents should form a representative sample of the eventual user population in terms of age, sex, educational level, cultural or ethnic background and (when relevant) physical ability. Particular attention should be paid to the inclusion of vulnerable sectors of the population when testing graphical symbols to be used in a safety context. The information collected from the respondents allows a judgement to be made concerning whether the sample is representative of the eventual user population.

7.4 Respondents' task in the judgement test

For each referent, instruct the respondent to read the information about the function and field(s) of application of the referent, and the description of the context in which the symbol might be seen, and to bear these in mind when making judgements. Where the referent has excluded functions specified on the application form [specified in 5(d)], draw the attention of the respondent to these excluded functions.

Instruct the respondent to examine all the variants shown on the single sheet or screen page before making any judgement.

For graphical symbols intended for the general population, instruct the respondents to judge the comprehensibility of each variant by following this instruction:

"The symbol is intended to communicate its meaning to the general population. Please judge the comprehensibility of each symbol by writing the percentage of the general population that you expect would understand this meaning. Please note that 100 % means everybody would understand it, with no one failing, and 0 % means nobody at all would understand it.

Remember that what we want is your estimate of the percentage of other people in the general population who are likely to understand the symbol correctly. The percentages you write in do not have to add up to 100. Please do not confer when making your estimates, as it is your response which is important."

For graphical symbols intended for specialist populations (e.g. welders, factory workers, construction workers) replace the phrase "the general population" with a phrase which describes the intended user population (e.g. "welders", "factory workers", "construction workers").

Instruct the respondents to write or enter their response on the line directly below each variant.

If necessary, when a screen presentation is being used, the test administrator can enter the responses following the instructions of the respondent. The respondent should confirm the accuracy of the response before it is confirmed (e.g. by pressing the Enter key).

7.5 Analysis of the results of the judgement test

Tabulate the results for each country that participated in the test in a matrix as shown in B.2, so that there is one column for each variant and one row for each respondent. For each respondent, enter in one row the responses given by the respondent to each variant. For each variant, calculate the mean and median of the responses and enter the appropriate values in the rows labelled "Mean" and "Median".

7.6 Presentation of results

Prepare separate forms for each referent for each country which participated in the test (see B.3). Include the data from one country for all variants of the referent in a single form.

In the results form for each referent, include the following information:

NOTE 1 The form shown in B.3 is available on www.iso.org/tc145/sc1.

- a) the referent;
- b) the year and month in which the judgement test was conducted;
- c) the function of the referent;
- d) the field(s) of application;
- e) the intended user group specified in the instructions to respondents;
- f) the country in which the test was conducted;
- g) the total number of respondents;
- h) the number of respondents in each age group (15 to 30, 31 to 50, over 50);
- i) the number of respondents of each sex;
- j) the number of respondents in each educational category;
- k) the number of respondents who report themselves to be disabled;
- l) copies of the graphical symbol variants tested in the colours in which they were presented;
- m) the context information presented when the variants were tested;
- n) for each variant, a verbal statement of the colour in which it was presented;
- o) the dimensions (height and width) of the image as tested, expressed in millimetres;
- p) identification codes of the variants;
- q) the source of each variant;
- r) the mean and median of the responses for each variant;
- s) the name and contact address of the test administrator.

NOTE 2 An example of a completed form is given in B.4.

7.7 Combination of results from different countries

Take the data from all of the countries that participated in the test. Calculate for each individual variant the mean and median of the aggregated responses from all participating countries.

Construct a results form similar to that described in 7.6 for each referent, showing the aggregated data from all countries which participated in the judgement test.

7.8 Selection of variants for the comprehension test following the judgement test

When there are three or less variants for a particular referent, the comprehension test can be used instead of the judgement test. When there are four or more variants for a particular referent, the judgement test should be used first. The comprehension test is then used if the judgement test has failed to yield a variant with a mean or median response higher than the criterion of acceptability, but has yielded one or more variants with a mean or median response higher than the value required to justify further testing. The criterion of acceptability and the value which justifies further testing are decided by the relevant standardization body.

When the results of the judgement test are used to select variants for the comprehension test, select the variant having the highest mean or median of responses on the judgement test, and the two other variants which are both significantly different in graphic detail from the highest-scoring variant and have the highest mean or median responses on the judgement test.

NOTE 1 Variants differ significantly in graphic detail if their graphical symbol elements differ or if the graphical symbol elements are the same but their sizes relative to one another or their relative dispositions differ.

Where the results from the two or more countries agree on the three variants selected, these three variants shall be selected for the comprehension test. Where the results from the various countries do not agree, select the two variants, from each country, which have the highest mean or median.

NOTE 2 Three variants are usually sufficient for the comprehension test, which assesses the degree to which respondents interpret the graphical symbol correctly.

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Annex A (normative)

Comprehension test

A.1 Example of an instruction sheet for a comprehension test

Instructions

This booklet contains examples of symbols (pictograms). We want to see how well these symbols are understood. You will be helping us do this by writing down what you think each symbol means.

It is very important that you write down exactly what, according to you, the message is. If your answer is too vague or general, we will not be able to determine if the correct message is getting across.

Each page of this booklet will show a symbol and where you might find it (such as at an airport, on a container, on a factory wall):

- there is a blank for you to write down exactly what the symbol means;
- there is another blank to write down the action that you should take in response to the symbol.

Some of the symbols may be easy and some may be difficult to understand. Just do the best you can for each of the symbols. If you can't figure out what a symbol means, write down "**don't know**". Don't leave a blank.

It is important you **work alone**. Do not talk to anyone or make comments out loud.

There is **no time limit**, but try not to spend too much time on each symbol. Once you finish a page do not go back over it.

Remember, it is the symbols that are being tested not you.

The next page asks you for some information about yourself. Please do not give your name.

The page after that is an example sheet showing a graphical symbol and written below it what it means. It shows an example of good and poor answers.

The test pages come after the example sheet.

Thank you for taking part in this study.

If you have any queries, you can contact ***** by phone on ***** or by e-mail at

*****.

A.2 Example of a respondent self-report sheet

Test administrator: _____

This is a study of the meaning of symbols. First we would be grateful if you would provide some information about yourself. Please do NOT give your name; the data is entirely anonymous.

Date: _____

Age (please put a tick against whichever age group you are in):

15 – 30 _____

31 – 50 _____

over 50 _____

Sex (please put a tick to show which sex you are): Male _____ Female _____

Educational level (please put a tick against whichever one alternative best describes the level of education you completed or the qualification you obtained):

Left school at normal school-leaving age _____

Post-school qualification which is not a degree _____

Degree or degree equivalent _____

How would you describe your ethnic or cultural background? _____

Are you disabled? Yes _____ No _____

If you are disabled, which of the following describes your disability? (please put a tick against whichever is appropriate):

Problems with physical mobility _____

Problems with hearing _____

Problems with your sight _____

A.3 Example of an example sheet for a comprehension test



This symbol appears in airports, stations, shops, public buildings.

You might find it on a signpost or door.

Exactly what do you think this symbol means?

A place where you can tend to your baby

What action should you take in response to this symbol?

I would go there if I needed to feed my baby or change my baby's clothes

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A.4 Example of a test page for a comprehension test



This symbol appears in hotels, airports, stations, town centres and guidebooks.

You might find it on a signpost, door or wall, or printed in a guidebook.

Exactly what do you think this symbol means?

What action should you take in response to this symbol?

A.5 Form for presenting the results of the comprehension test

Referent (meaning):

Year:

Month:

Function:

Field(s) of application:

Intended user group:

Country:

Number of respondents

Age 15 – 30:

31 – 50:

over 50:

Sex

Male:

Female:

Educational levels i:

ii:

iii:

Number reporting physical disability:



Symbol



Symbol



Symbol



Variant A



Variant B



Variant C

Context information:

Colour:

Height and width (mm) of image tested:

Source:

Sample size

Category	f	%	cum %	f	%	cum %	f	%	cum %
----------	---	---	-------	---	---	-------	---	---	-------

1 Correct

2 Wrong

3 Don't know

4 No response

Sum

2b Wrong - opposite meaning

-

-

-

page 2

Referent (meaning):

Year:

Month:

Country:

Most frequent responses		Response	frequency	Response	frequency	Response	frequency
Category 1	1						
	2						
	3						
	4						
	5						
Category 2a	1						
	2						
	3						
	4						
	5						
Category 2b	1						
	2						
	3						
	4						
	5						

Name and contact address of the test administrator or response categorizer: _____

A.6 Form for showing the combined data from participating countries for the comprehension test

Referent (meaning):

Year:

Month:

Function:

Field(s) of application:

Intended user group:

Participating country:

Number of respondents

Age 15 – 30:
 31 – 50:
 over 50:

Sex Male:
 Female:

Educational levels i:

ii:

iii:

Number reporting physical disability:

Variants:

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Symbol

Symbol

Symbol

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Context information:

Colour:

Height and width (mm) of image tested:

Source:

Number of respondents

Response category

f

%

cum %

f

%

cum %

f

%

cum %

1 Correct

2 Wrong

3 Don't know

4 No response

Sum

2b Wrong - opposite meaning

-

-

-

Name and contact address of the test administrator or response categorizer for each country:
