SLOVENSKI STANDARD
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Grafiļ ni simboli ï Preskusne metode za presojo razumljivosti in razumevanja

Graphical symbols -- Test methods for judged comprehensibility and for comprehension

Symboles graphiques -- Méthodes d'essai pour la compréhensibilité estimée et la compréhension

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INTERNATIONAL STANDARD

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Graphical symbols — Test methods for judged comprehensibility and for comprehension

Symbols graphiques — Méthodes d'essai pour la compréhensibilité estimée et la compréhension

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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 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

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

This second edition cancels and replaces the first edition (ISO 9186:1989), which has been technically revised.

Annexes A to D form a normative part of this International Standard.

Graphical symbols — Test methods for judged comprehensibility and for comprehension

1 Scope

This International Standard specifies:

— the procedure to be used in gathering the information needed to request standardization of graphical symbols;

— the method to be used in testing which variant of a graphical symbol is judged the most comprehensible; and

— the method to be used in testing the extent to which a variant of a graphical symbol communicates its intended message.

The purpose of this International Standard is to ensure that graphical symbols, and signs using graphical symbols, are readily understood. It in no way ensures that prohibitions or warnings using graphical symbols or symbol signs designed in accordance with this International Standard will, once understood, be complied with.

NOTE Appropriate attitudes and motivation are required before compliance with any sign will result. A pictorial sign is not intended as an easy alternative to surveillance, physical barriers, education, or other means of achieving a safe situation.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 3864:1984, *Safety colours and safety signs*.

ISO 7000, *Graphical symbols for use on equipment — Index and synopsis.*

ISO 7001:1990, *Public information symbols*.

ISO/TR 7239:1984, *Development and principles for application of public information symbols*.

IEC 60417-1, *Graphical symbols for use on equipment — Part 1: Overview and application.*

IEC 60417-2, *Graphical symbols for use on equipment — Part 2: Symbol originals.*

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

3.1
complementary referents
referents which perform a related function in the same set

NOTE Examples of referents with related meanings are “Squash” and “Tennis”.

3.2
comprehensibility judgement test
procedure for eliciting judgements of the comprehensibility of proposed graphical symbols

3.3
comprehension test
procedure for quantifying the degree of understanding of proposed graphical symbols

3.4
excluded function
function of a referent or of a complementary referent which is not to be denoted by the graphical symbol

EXAMPLE “Bath” should not indicate “shower” or “swimming pool”.

3.5
graphical symbol
visually perceptible figure with a particular meaning used to transmit information independently of language

NOTE It may be produced by drawing, printing or other means.

3.6
image content
elements of the graphical symbol and their relative disposition

3.7
negation of a referent
modification of an image, by adding a graphic element, in order to negate a specific function

NOTE Negation usually indicates prohibition.

3.8
referent
idea or object that the graphical symbol is intended to represent

3.9
safety sign
general safety message obtained by a combination of colour and geometric shape and which, by the addition of a graphical symbol, gives a particular safety message

3.10
safety symbol
graphical symbol used together with a safety colour and safety shape to form a safety sign

3.11
variant
alternative design for a given referent

4 Principle

The various stages in the procedure are:

a) the collection of the information needed concerning the request for standardization of a graphical symbol (see 5.1);

b) the collection of a set of existing and proposed variants for each referent (see 5.2). At an early stage of the work, any body responsible for proposing a graphical symbol should ascertain whether any other graphical symbol has been standardized or is under development within ISO for

- the same referent,
- the same image content,
- the same function, or
- the same user population;

c) when there are four or more variants for one referent, testing them using the comprehensibility judgement test in at least two countries (see 5.3, 6.1 and 7.1);

d) when there are three or fewer variants for one referent, testing them using the comprehensibility judgement test in at least two countries (see 5.3, 6.1 and 7.1) or the comprehension test in at least three countries (see 5.3, 6.2 and 7.2);

e) when any variant for one referent exceeds the minimal score to justify further testing, but no variant reaches the criterion of acceptability on the comprehensibility judgement test, testing the comprehension of the variants judged most comprehensible using the comprehension test in at least three countries (see 6.2 and 7.2);

f) acceptance as a standard graphical symbol of the graphical symbol which either is judged the most comprehensible and surpasses the criterion of acceptability (see 6.2.7 and 7.2.7), or surpasses the criterion of acceptability on the comprehension test (see clause 8).

5 Procedure

5.1 Collection of information

Carefully consider the details of the request for the testing and standardization of a graphical symbol. For this purpose, complete the form shown in clause A.1.

Check existing and draft International Standards. If there is an existing standard graphical symbol for the referent which has been developed by the ISO method described in this document, or by the earlier method described in ISO 9186:1989, it shall be used. If there is a standard graphical symbol which was not developed using the ISO method described in this document or the earlier method described in ISO 9186:1989, there shall be strong grounds for not using it; such grounds might include duplication of graphical symbols in different International Standards, or evidence concerning the inadequacy of the graphical symbol. In such cases, the ISO Technical Committee which produced the standard graphical symbol shall be approached with a request for the graphical symbol to be reviewed at the next updating of the International Standard.

If a graphical symbol for the referent is undergoing testing, await the outcome of the testing programme. If there is an existing or draft International Standard, or a graphical symbol for the referent is undergoing testing, it is not necessary to continue with the remainder of this procedure.

An analysis of all aspects of the communication problem is a necessary first step in determining whether a graphical symbol is the correct solution to the communication problem.

The form in clause A.1 lists the points which shall be considered and the information required. Guidance on filling in the form is given in clause A.2, and an example of a completed form is given in clause A.3.

5.2 Collection of graphical symbol variants for each referent

5.2.1 Collect as many existing graphical symbol variants as possible. Ensure that graphical symbols already in international use are included.

5.2.2 If the number of graphical symbol variants collected appears to be insufficient, encourage the development of additional trial designs so as to improve the chances of obtaining positive results from the test programme.

5.2.3 Where two or more graphical symbols in the collection are very similar in graphical content, include only one of them in the test programme.

5.2.4 Exclude from the test programme any graphical symbol variants that are very similar in graphical content to an existing graphical symbol in the International Standards for public information, equipment or safety, including those in ISO 7000, ISO 7001, IEC 60417-1, IEC 60417-2 and ISO 3864.

NOTE This is intended to prevent the testing of variants that are easily confused with existing graphical symbols.

5.2.5 Propose for testing only those graphical symbol variants which meet the requirements of ISO/TR 7239 in graphic quality. Check that no variants are subject to copyright or are licensed trademarks.

5.3 Selection of the test to apply

A variant can be accepted as a standard graphical symbol for a particular referent if it reaches the criterion level of acceptability on the comprehensibility judgement test or the comprehension test.

If there are four or more variants for a particular referent, conduct a comprehensibility judgement test in at least two countries in order to determine the variants judged highest on comprehensibility. If no variant reaches the criterion of acceptability on judged comprehensibility, then the comprehension test can be administered.

If there are fewer than four variants for a particular referent, either the comprehensibility judgement test or the comprehension test shall be administered.

Carry out the tests in one of two ways, either using printed presentation (see clause 6) or using computer screen presentation (see clause 7), depending on which is most practicable.

6 Tests using printed presentation

6.1 Comprehensibility judgement test

6.1.1 Preparation of test material

6.1.1.1 Make any necessary adjustments to the graphical representations of the test symbols so that they meet the recommendations of ISO/TR 7239.

To ensure that all graphic materials are of the same standard, they should all be prepared at one production site and then distributed to the test administrators in each participating country.

The variants for one referent should be printed on one single sheet.

Variants should be black on white. Colour should only be used if colour is used for coding information. If a coloured variant is used, ensure that the contrast between the figure and its background 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.

6.1.1.2 Prepare an information card for each referent. The information card shall state

— the referent,

— its function,

— its field(s) of application,

— excluded functions(if any).

Extract this information from the completed form for testing and standardization of a graphical symbol (see clause A.1).

6.1.1.3 All the variants for one referent should be printed in the standard dimensions of 28 mm (± 5 %) × 28 mm (± 5 %) on a sheet of paper of size A4 or similar. The variants should be positioned equally-spaced around the circumference of a circle with a radius of 80 mm, which has its centre at the centre of the sheet. A line for the response should be drawn under each variant. Write the name of the referent on the sheet.

6.1.1.4 Give each respondent a copy of the information card on top of the sheet showing the variants.

The variants for a number of different referents can be tested on each group of respondents. A separate sheet shall be used for the set of variants for each referent.

6.1.2 Respondents

6.1.2.1 Conduct the test in at least two countries. Whenever possible the countries chosen should have different cultural backgrounds, for example one European country and one Asian country.

To test a set of variants for a given referent, at least 50 respondents in each country are required.

6.1.2.2 The sample of respondents should resemble the eventual user population in terms of age, sex, educational level, occupation, cultural background and (when relevant) physical ability. This information should be recorded.

Respondents who have taken part in one test (comprehensibility judgement or comprehension) for any referent should not be used in any other test on that same referent.

6.1.2.3 The sample should preferably consist of respondents who can be expected to be familiar with a given referent.

6.1.3 Respondents' task in the comprehensibility judgement test

6.1.3.1 For each referent, instruct the respondent to read the information card showing the function and field(s) of application of the referent, and to bear these in mind when making judgements. Where the referent has excluded functions specified on the request for standardization (see clause A.1), draw the attention of the respondent to these excluded functions.

6.1.3.2 Before the respondent makes any judgement, he/she should examine all the variants shown on the single sheet.

Instruct the respondents to judge the comprehensibility of each variant by following this instruction:

“Each symbol is supposed to mean (provide the intended meaning). Please write the percentage of the population that you expect would understand this meaning.”

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

6.1.4 Analysis of the results of the comprehensibility judgement test

Tabulate the results for each country that participated in the test in a matrix as shown in clause B.1, 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. Then for each variant calculate the mean and median of the responses and enter the appropriate values in the rows labelled “Mean” and “Median”.

If the responses of the comprehensibility judgement test are not normally distributed, the median of the responses should be used instead of the mean score.

6.1.5 Presentation of results

6.1.5.1 Prepare separate forms for each referent for each country which participated in the test (see clause B.2). Include the data from one country for all variants of the referent in a single form. Within each form, present variants in descending order of comprehensibility, as indicated by the mean responses.

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

a) the referent;

b) the function of the referent;

c) the field(s) of application;

d) the country in which the test was conducted;

e) the number of respondents in each age group, the sex of the respondents, their educational level, occupations, cultural backgrounds and if relevant their physical ability;

f) copies of the graphical symbol variants tested with a statement of their colour;

g) identification codes of the variants;

h) the source of each variant;

i) the mean and median of the responses for each variant;

j) the information about the respondents collected in 6.1.2.2.

An example of a completed form is given in clause B.3.

6.1.6 Combination of the results from different countries

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

Construct a results form similar to that described in 6.1.5.2 for each referent, showing the aggregated data from all countries which participated in the comprehensibility judgement test.

6.1.7 Determination of the variant judged most comprehensible

Study the mean responses obtained in stage 6.1.6. If any single variant obtained a mean higher than the criterion of acceptability for the comprehensibility judgement test, this variant may be accepted as the standard graphical symbol for the referent.

If more than one variant obtained a mean higher than the criterion of acceptability, select the one least likely to be confused with an existing standard graphical symbol (a graphical symbol which has been tested using the ISO procedure).

If any variants obtained a mean higher than the minimal score to justify further testing but no variant obtained a mean more than the criterion of acceptability, these variants should be subjected to the comprehension test.

If no variant obtained a mean higher than the minimal score to justify further testing, do not administer the comprehension test. Further variants shall be collected or designed, and this fresh set of variants subjected to the test procedure.

NOTE The criteria of acceptability may be obtained from the Secretary of ISO/TC 145.

6.1.8 Selection of variants for the comprehension test

6.1.8.1 When there are three or fewer variants for a particular referent, the comprehension test may be used instead of the comprehensibility judgement test.

NOTE When there are four or more variants for a particular referent, the comprehension test is used if the comprehensibility judgement test has failed to yield a variant with a mean response higher than the criterion of acceptability and has yielded one or more variants with a mean response higher than the minimal score to justify further testing.

6.1.8.2 For each country which participated in the comprehensibility judgement test, select the variant having the highest mean of responses and the two other variants which are significantly different in graphic detail from the highest-scoring variant, and which have the highest mean responses.

6.1.8.3 Where the results from the various countries agree on the three variants which were selected in 6.1.8.2, select these three variants for the comprehension test. Where the results from the various countries do not agree, select from the variants selected in 6.1.8.2 the two variants from each country which have the highest mean score.

NOTE Three variants are usually sufficient for the comprehension test, which assesses the degree to which respondents interpret the graphical symbol correctly when they see it for the first time.

6.2 Comprehension test

6.2.1 Preparation of test material

6.2.1.1 Make a set of test sheets (size A6 or similar) for each referent. Each sheet should show one of the graphical symbol variants to be tested and below it a line for the subject's response. Use a standard symbol size of 28 mm (± 5 %) × 28 mm (± 5 %) and position the symbol in the centre of the sheet.

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; for example, "at an airport", "on the wall of a public building". This information should be printed adjacent to the graphical symbol on each printed sheet.

For referents requiring some specific action when encountering the symbol, judging the quality of the responses can be improved by asking the following two questions: "What do you think this symbol means?" and "What action would you take in response to this symbol?" In this case both questions are to be printed in the space below the graphical symbol in such a way that enough room is available for writing down the answers.

6.2.1.2 Allocate the different variants of all referents to different test sets, which may contain a number of different referents, but shall contain only one variant of a given referent. 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.

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.

The number of referents in any given test set shall not exceed 20.