INTERNATIONAL STANDARD

ISO 4660

Second edition
1991-02-01

Rubber, raw natural — Colour index test

Caoutchouc naturel brut — Essai d'indice de couleur

Reference number
ISO 4660:1991(E)

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.

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.

International Standard ISO 4660 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*.

This second edition cancels and replaces the first edition (ISO 4660:1977), of which it constitutes a technical revision.

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Rubber, raw natural — Colour index test

1 Scope

This International Standard specifies a method of determining the colour of raw natural rubber according to a standard colour scale.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1796:1982, *Rubber, raw — Sample preparation.*

ISO 2393:1973, *Rubber test mixes — Preparation, mixing and vulcanization — Equipment and procedures.*

3 Principle

The raw rubber is prepared in the form of a moulded disc of specified thickness, and the colour of this disc is compared and matched as closely as possible with that of standard glasses. Colour matching is carried out under diffuse daylight illumination against a matt white background, preferably by use of a comparator which suitably locates and shrouds the test piece and standard glass.

The standard glasses used are calibrated according to the intensity of their colour (amber) to provide a colour index scale in which the higher index values correspond to darker colours.

4 Apparatus

4.1 Laboratory mill, conforming to the requirements of ISO 2393.

4.2 Mould, of stainless steel or aluminium, 1,6 mm ± 0,05 mm thick, having cavities approximately 14 mm in diameter with two mould covers of similar material, 1 mm to 2 mm thick. A suitable mould is illustrated in figure 1.

4.3 Platen press, capable of applying a pressure of not less than 3,5 MPa over the platen surfaces and maintaining platen temperatures of 150 °C ± 3 °C. Platens with lateral dimensions of 200 mm × 200 mm are suitable.

4.4 Punch, for preparation of the test pieces.

The purpose of the punch is to produce test pieces of approximately constant volume quickly and without difficulty. The punch shall consist of a flat-ended cylindrical anvil and a coaxial tubular knife moving independently of one another; a single action of the handle shall compress a portion of the material to a thickness of approximately 3 mm and shall cut out a disc of approximately 13 mm diameter. The test piece need only be approximately constant in volume because the final shaping to exact dimensions is carried out in the mould during the pre-heating period.

NOTE 1 This is identical with the test piece punch described in ISO 2007:1981 *Rubber, unvulcanized — Determination of plasticity — Rapid plastimeter method.*

4.5 Transparent polyester or cellulose film, approximately 0,025 mm thick.

4.6 Comparator, as illustrated in figure 2 or as available commercially.

4.7 **Standard coloured glasses**, conforming to the requirements of table 1 (colour index scale: 1 to 5 units in half-unit steps and 5 to 16 units in unit steps).[1)]

Table 1 — Calibration table for standard glasses

Colour index	CIE[1)] chromaticity coordinates using standard illuminant B[2)]		
	x	y	z
1	0,357 7	0,368 6	0,275 2
1,5	0,362 9	0,372 8	0,265 5
2	0,367 2	0,377 0	0,255 8
2,5	0,373 8	0,380 4	0,245 8
3	0,377 6	0,385 5	0,236 9
3,5	0,384 2	0,389 6	0,226 2
4	0,388 0	0,393 5	0,218 5
4,5	0,392 5	0,397 9	0,211 0
5	0,396 5	0,400 3	0,203 2
6	0,405 0	0,408 9	0,186 1
7	0,414 1	0,412 4	0,173 6
8	0,412 6	0,418 6	0,159 8
9	0,430 2	0,423 0	0,146 9
10	0,437 1	0,425 9	0,137 0
11	0,443 9	0,427 0	0,129 0
12	0,449 1	0,430 8	0,120 0
13	0,454 2	0,432 9	0,113 0
14	0,461 0	0,435 0	0,104 0
15	0,466 2	0,436 1	0,097 7
16	0,471 0	0,438 9	0,090 0

1) Commission Internationale de l'Éclairage.

2) Standard illuminant B corresponds to the yellower phases of daylight (colour temperature 4 870 K).

5 Procedure

5.1 Sample preparation

Homogenize the raw rubber as described in ISO 1796.

5.2 Test piece preparation

Clean the mill (4.1) thoroughly and then proceed as follows:

Take a test portion of about 30 g from the homogenized piece and pass three times (doubling the sheet between passes) between the mill rolls, at room temperature and with the distance between the rolls adjusted so that the final sheet thickness is about 1,7 mm. Immediately double the sheet, which shall be uniform in texture and free from holes, and lightly press the two halves together by hand, avoiding the formation of air bubbles. From the doubled sheet (3,2 mm to 3,6 mm thick) cut two pellets with the test piece punch (4.4) and press them lightly together.

Press this test piece in the mould (4.2) between two sheets of polyester or cellulose film (4.5), with mould covers superimposed, at a pressure of not less than 3,5 MPa for 5 min ± 0,2 min at 150 °C ± °C. Retain the test piece in the mould, with the transparent cover films attached, for testing. The moulded test piece shall be 1,6 mm ± 0,1 mm thick excluding cover films, and shall be free from extraneous contaminants.

5.3 Colour matching

Compare the test piece with the standard glasses (4.7). Carry out the colour matching under diffuse daylight illumination against a matt white background, viewing in a direction normal to the major surface of the test piece. Take the colour index of the test piece as that of the glass giving the closest colour match.

If the comparator (4.6) shown in figure 2 is used, first place a sheet of white paper (with holes to accommodate the projections) on the base plate. Then fit the disc of standard glasses and the filled mould (with transparent cover films attached) over the projections and place the cover plate in position. Carry out the colour matching.

6 Expression of results

Report the colour index of the rubber to the nearest half-unit for index values 1 to 5 and to the nearest unit for higher values.

Very occasionally the colour of the rubber cannot be matched owing to the presence of strong yellow, green or grey tints. In this case report that the colour index cannot be determined.

1) These glasses are also referred to as Lovibond Comparator discs, 4/19A in 1 to 5 units and 4/19B in 5 to 16 units, and are commercially available from: Tintometer Limited, Salisbury, England. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named.

7 Test report

The test report shall include the following particulars:

a) a reference to this International Standard;

b) all details necessary for the identification of the sample;

c) the results and the units in which they have been expressed;

d) any unusual features noted during the determination;

e) any operation not included in this International Standard or in the International Standards to which reference is made, plus any operation regarded as optional.

Dimensions in millimetres

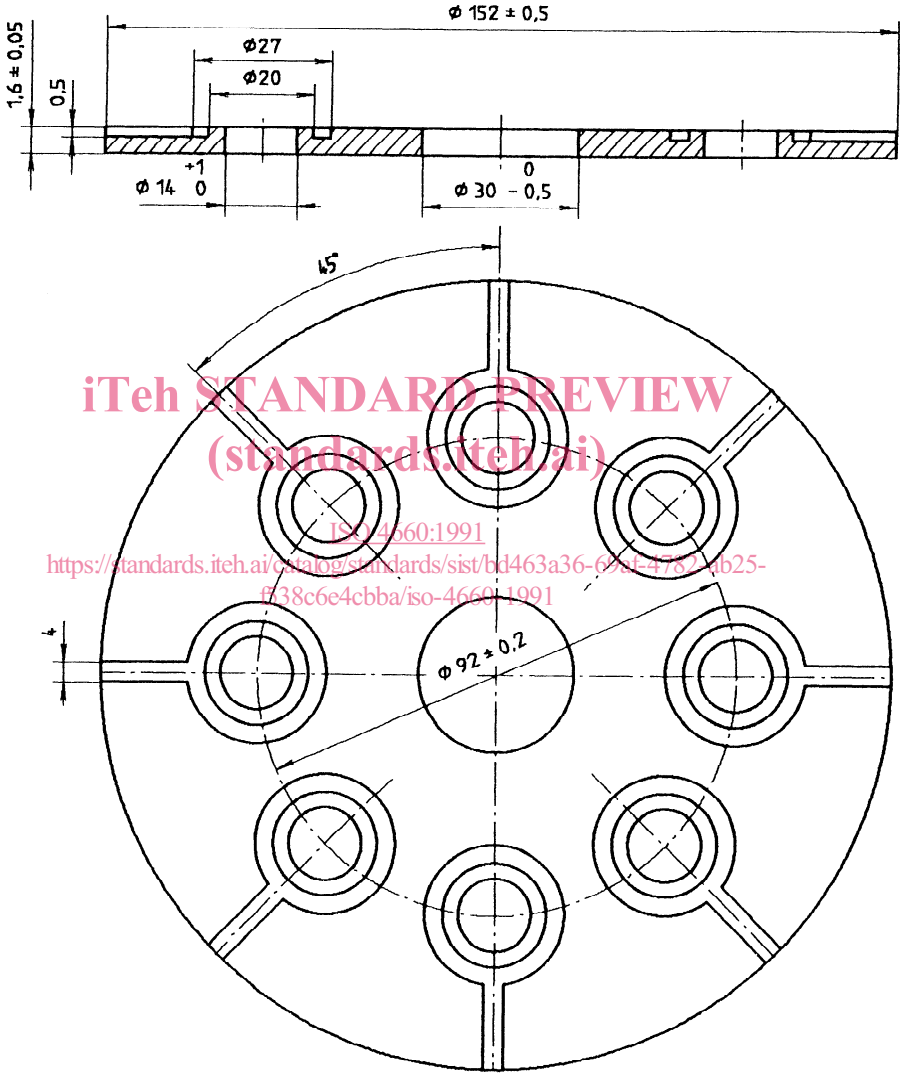

Figure 1 — Mould for colour index test

Dimensions in millimetres

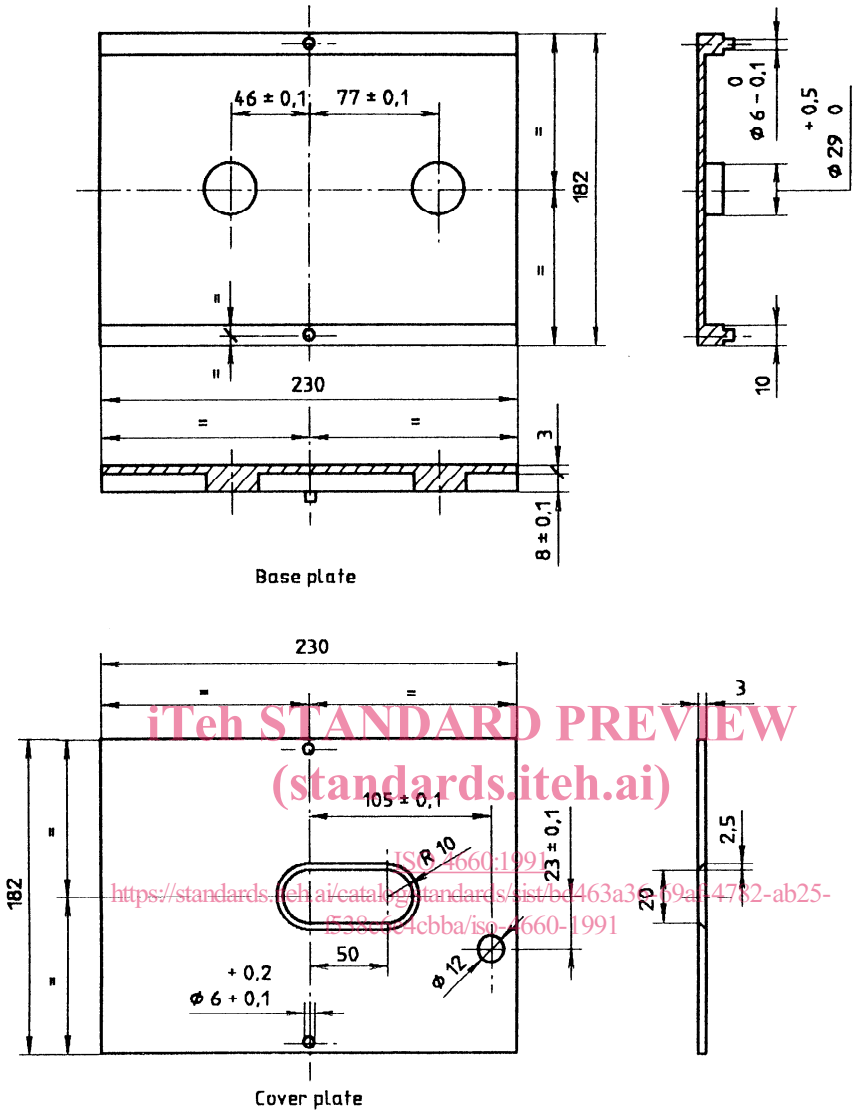

Figure 2 — Comparator for use with commercial Lovibond Comparator discs

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Descriptors: rubber, natural rubber, crude rubber, tests, determination, colour index.

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