

BS ISO 4660:2011



BSI Standards Publication

# Rubber, raw natural — Colour index test

**bsi.**

...making excellence a habit.™

**National foreword**

This British Standard is the UK implementation of ISO 4660:2011. It supersedes BS ISO 4660:1999 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PRI/23, Test methods for rubber and non-black compounding ingredients.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© BSI 2011

ISBN 978 0 580 72980 5

ICS 83.040.10

**Compliance with a British Standard cannot confer immunity from legal obligations.**

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 March 2011.

**Amendments issued since publication**

Date	Text affected
------	---------------

---

# INTERNATIONAL STANDARD

BS ISO 4660:2011

**ISO**  
**4660**

Fourth edition  
2011-02-15

---

---

## Rubber, raw natural — Colour index test

*Caoutchouc naturel brut — Essai d'indice de couleur*



Reference number  
ISO 4660:2011(E)

© ISO 2011

**PDF disclaimer**

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2011

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland

## Contents

Page

Foreword .....	iv
1 Scope .....	1
2 Normative references .....	1
3 Principle .....	1
4 Apparatus .....	1
5 Procedure .....	4
5.1 Test piece preparation .....	4
5.2 Colour matching .....	5
6 Expression of results .....	5
7 Precision and bias .....	5
8 Test report .....	5
Bibliography .....	6

## 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 4660 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 3, *Raw materials (including latex) for use in the rubber industry*.

This fourth edition cancels and replaces the third edition (ISO 4660:1999), which has been technically revised. The main change is the deletion of the subclause concerning sample preparation (old Subclause 5.1) together with the associated normative reference ISO 1795.

# Rubber, raw natural — Colour index test

**WARNING — Persons using this International Standard should be familiar with normal laboratory practice. This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.**

## 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 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 2393, *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.

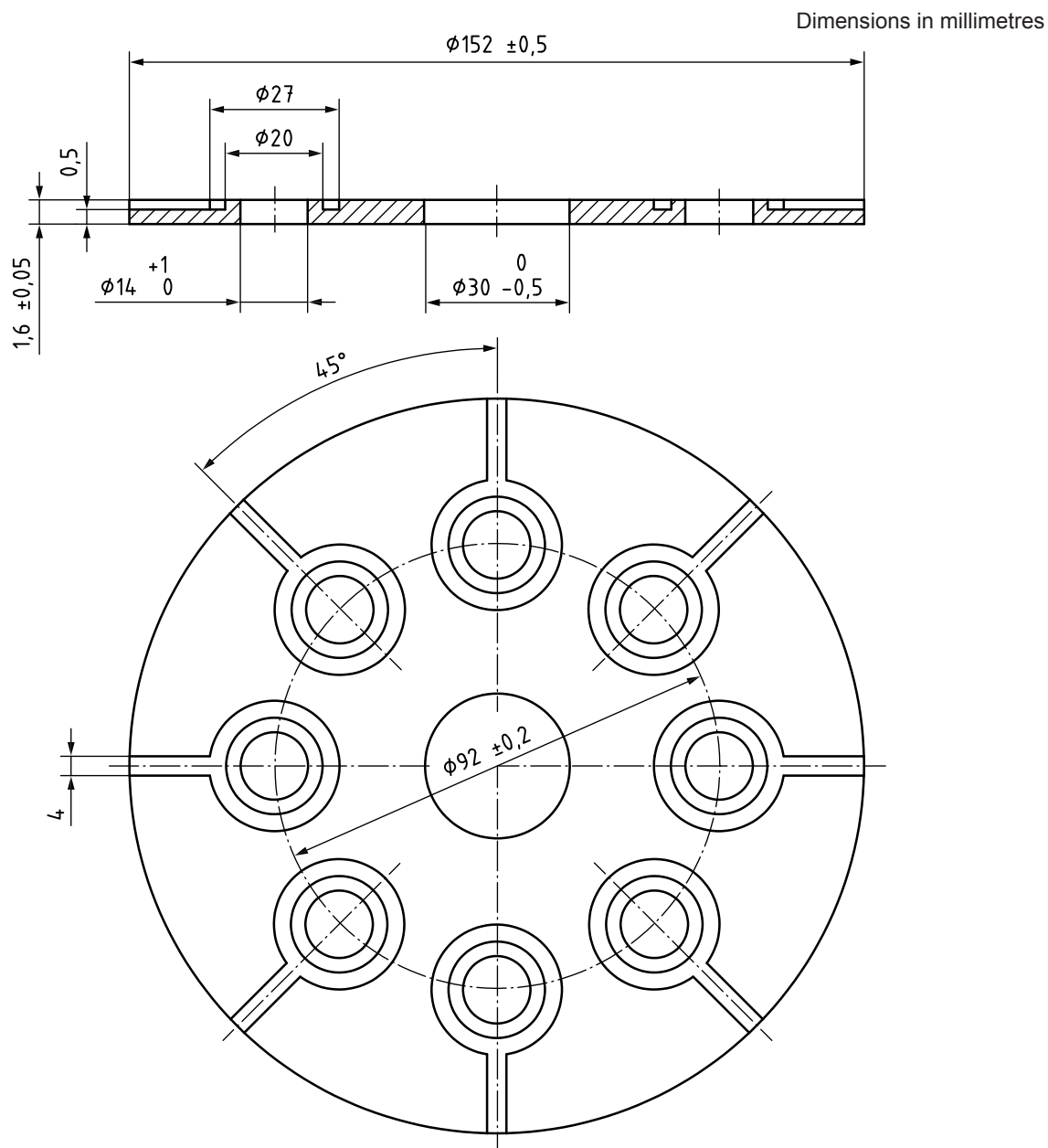


Figure 1 — Mould for colour index test

**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 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.

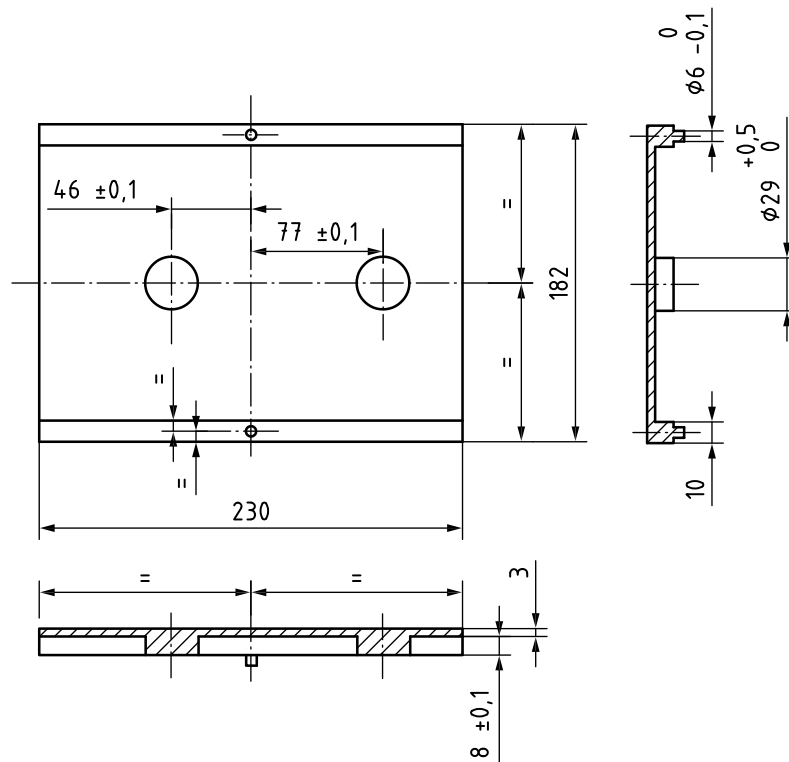
NOTE This is identical with the test piece punch described in ISO 2007:2007.

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

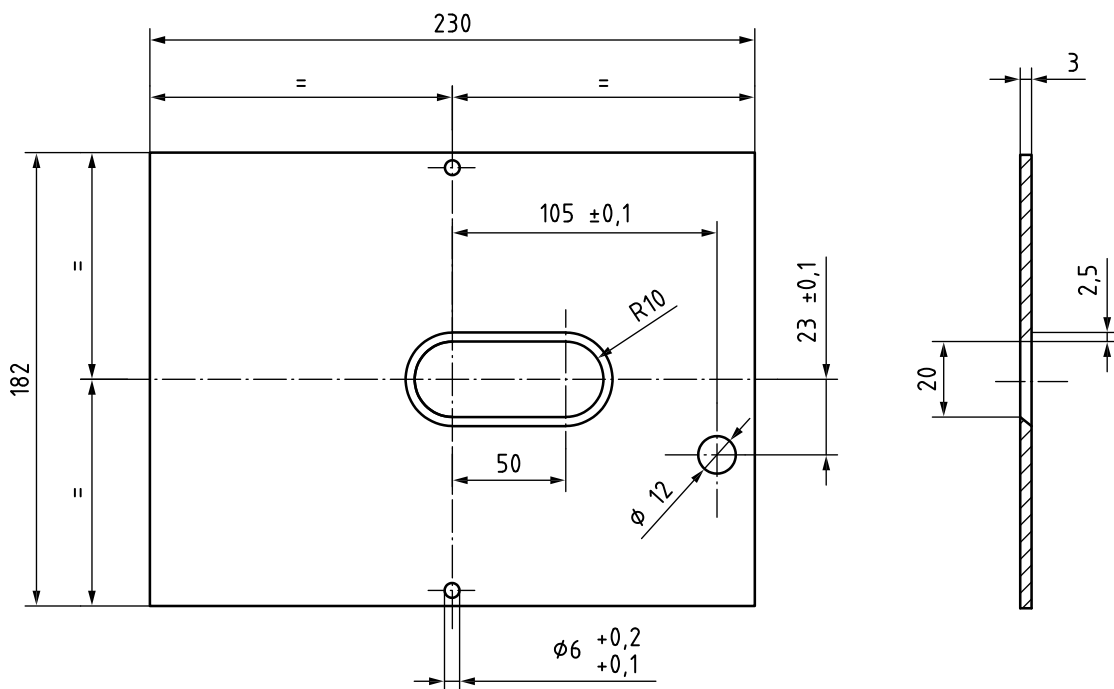
**4.6 Comparator**, as illustrated in Figure 2 or as available commercially.



Dimensions in millimetres



a) Base plate



b) Cover plate

Figure 2 — Comparator for use with commercial Lovibond Comparator discs

**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).<sup>1)</sup>

**Table 1 — Calibration table for standard glasses**

Colour index	CIE <sup>a</sup> chromaticity coordinates using standard illuminant B <sup>b</sup>		
	<i>x</i>	<i>y</i>	<i>z</i>
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

<sup>a</sup> Commission Internationale de l'Éclairage (International Commission on Illumination).  
<sup>b</sup> Standard illuminant B corresponds to the yellowish phases of daylight (colour temperature 4 870 K).

## 5 Procedure

### 5.1 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.

<sup>1)</sup> 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, Waterloo Road, Salisbury SP1 2JY, England. Tel: (01722) 327242, Fax: (01722) 412322. 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.

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  $\pm$  0,2 min at 150 °C  $\pm$  3 °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  $\pm$  0,1 mm thick, excluding cover films, and shall be free from extraneous contaminants.

## 5.2 Colour matching

Compare the test piece with 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 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, stating the reason, e.g. "green tint too strong".

## 7 Precision and bias

No statement is made about the precision and bias of this test method for measuring colour of raw natural rubber, since the results merely state whether there is conformance to the criteria for the parameter in terms of an index using a comparative standard.

## 8 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 Standard to which reference is made, plus any operation regarded as optional;
- f) the date of the test.

## Bibliography

- [1] ISO 2007:2007, *Rubber, unvulcanized — Determination of plasticity — Rapid-plastimeter method*







# British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

## About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards-based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

## Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at [bsigroup.com/standards](http://bsigroup.com/standards) or contacting our Customer Services team or Knowledge Centre.

## Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at [bsigroup.com/shop](http://bsigroup.com/shop), where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

## Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to [bsigroup.com/subscriptions](http://bsigroup.com/subscriptions).

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

**PLUS** is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit [bsigroup.com/shop](http://bsigroup.com/shop).

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email [bsmusales@bsigroup.com](mailto:bsmusales@bsigroup.com).

## BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

## Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

## Copyright

All the data, software and documentation set out in all British Standards and other BSI publications are the property of and copyrighted by BSI, or some person or entity that owns copyright in the information used (such as the international standardization bodies) and has formally licensed such information to BSI for commercial publication and use. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI. Details and advice can be obtained from the Copyright & Licensing Department.

## Useful Contacts:

### Customer Services

**Tel:** +44 845 086 9001

**Email (orders):** [orders@bsigroup.com](mailto:orders@bsigroup.com)

**Email (enquiries):** [cservices@bsigroup.com](mailto:cservices@bsigroup.com)

### Subscriptions

**Tel:** +44 845 086 9001

**Email:** [subscriptions@bsigroup.com](mailto:subscriptions@bsigroup.com)

### Knowledge Centre

**Tel:** +44 20 8996 7004

**Email:** [knowledgecentre@bsigroup.com](mailto:knowledgecentre@bsigroup.com)

### Copyright & Licensing

**Tel:** +44 20 8996 7070

**Email:** [copyright@bsigroup.com](mailto:copyright@bsigroup.com)



...making excellence a habit.™