IS 3660 (Part 13) : 1997

भारतीय मानक

प्राकृतिक रबड़ की परीक्षण विधियाँ

भाग 13 रंग का निर्धारण

(एन आर : 14)

(पहला पुनरीक्षण)

Indian Standard

METHODS OF TEST FOR NATURAL RUBBER

PART 13 DETERMINATION OF COLOUR

(N R : 14)

(First Revision)

ICS 83.040.10

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Price Group 3

Indian Standard

METHODS OF TEST FOR NATURAL RUBBER

PART 13 DETERMINATION OF COLOUR

(N R : 14)

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1 SCOPE

This standard (Part 13) prescribes the method for determination of 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 standard. At the time of publication the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
3660 (Part 11) : 1989	Methods of test for natural rubber : Part 11 Determination of plasticity (NR : 12) (*first revision*)
3660 (Part 51) : 1972	Methods of test for natural rubber : Part 51 Mixing and vulcanizing in a standard compound (NR : 9)
5599 : 1970	Methods for sampling of raw rubber

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

The laboratory mixing mill shall conform to the requirements given in NR : 9 of IS 3660 (Part 51.

4.2 Mould

Mould of stainless steel or aluminium, 1.6 ± 0.05 mm thick, having cavities approximately 14 mm in diameter with two mould covers or similar material, 1 to 2 mm thick. A suitable mould is illustrated in Fig.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 ± 3°C. Platens with lateral dimensions of 200 mm × 200 mm are suitable.

4.4 Punch

The punch is used 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 — This is identical with the test piece punch as described in IS 3660 (Part 11).

4.5 Transparent Polyester or Cellulose Film

Approximately 0.025 mm thick.

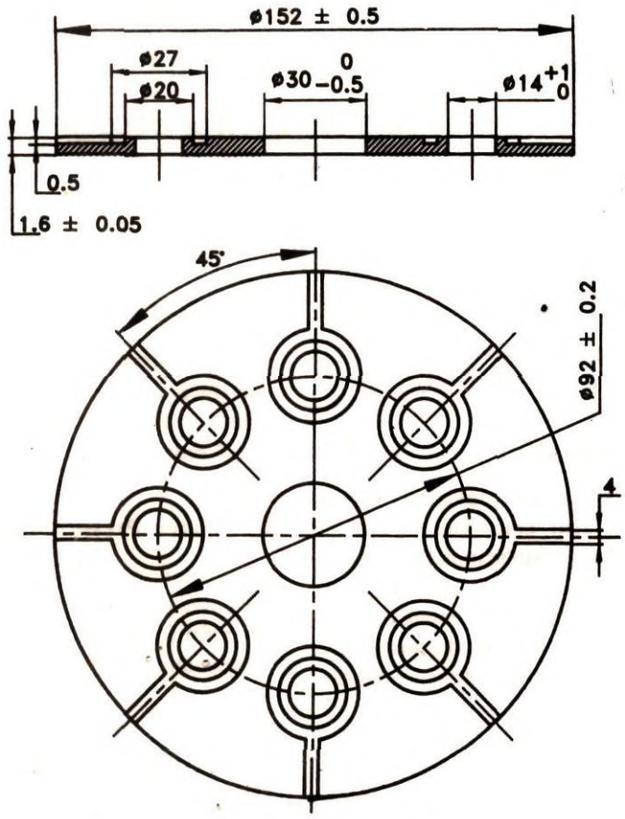
4.6 Comparator

As illustrated in Fig.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).

NOTE — These glasses are also referred to as Lovibond Comparator discs, 4/19A in 1 to 5 units and 4/19B in 5 to16 units, and are commercially available from: Tintometer Limited, Salisbury, England. This information is given for the convenience of users of this Indian Standard and does not constitute an endorsement by BIS of the product named.



All dimensions in millimetres.

FIG. 1 MOULD FOR COLOUR INDEX TEST

Table 1 Calibration Table for Standard Glasses

(*Clause* 4.7)

Colour Index	CIE[1] Chromaticity Coordinates Using Standard Illuminant B[2]		
	x	*y*	*z*
(1)	(2)	(3)	(4)
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

Table 1 — *Concluded*

[1] Commission Internationale de' Eclairage.

[2] Standard Illuminant B correspondence to the yellower phases of daylight (colour temperature 487°K).

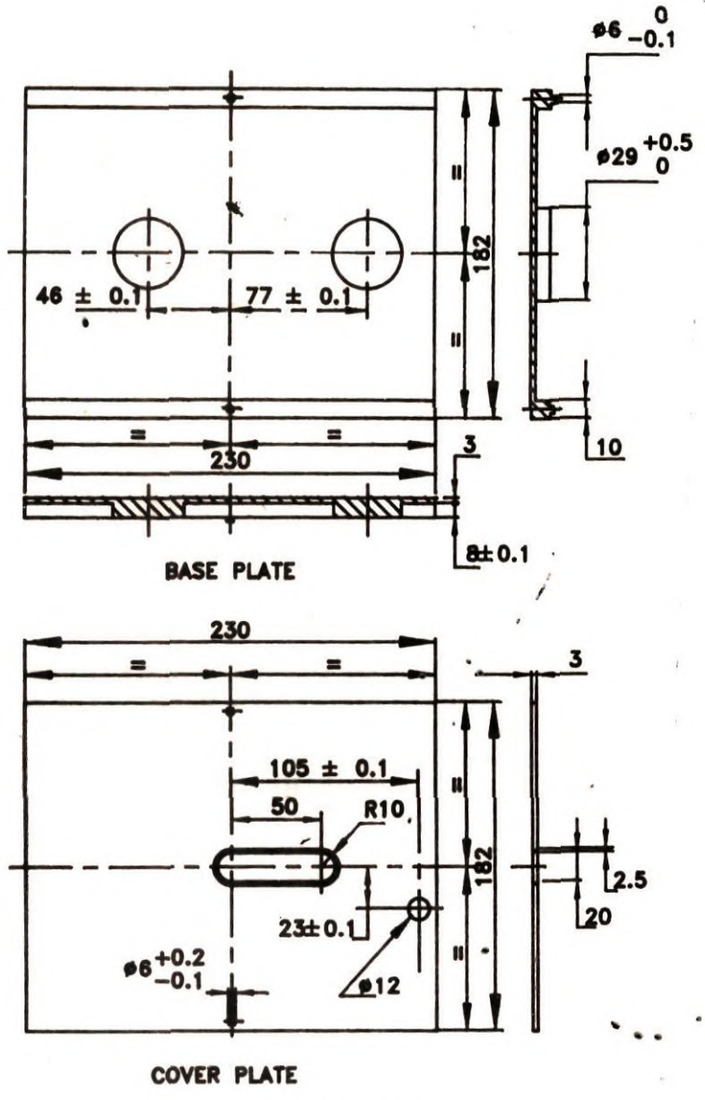
5 PROCEDURE

5.1 Sample Preparation

Homogenize the raw rubber as described in IS 5599.

5.2 Test Piece Preparation

Clean the mill thoroughly and then proceed



All dimensions in millimetres.

FIG. 2 COMPARATOR FOR USE COMMERCIAL LOVIBOND COMPARATOR DISCS

as follows:

a) Take a test portion of about 30g 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 to 3.6 mm thick) cut two pellets with the test piece punch and press them lightly together.

b) Press this test piece in the mould between two sheets of polyester or cellulose film, with mould covers superimposed, at a pressure of not less than 3.5 MPa for 5 min ± 0.2 min at 150 ± 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 ± 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. 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 Fig. 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

6.1 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.

6.2 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.

7 TEST REPORT

The test report shall include the following particulars:

a) a reference to this 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 standard to which reference is made, plus any operation regarded as optional.

ANNEX A

(*Foreword*)

TABLE SHOWING CORRESPONDENCE OF THE VARIOUS METHODS OF TESTS COVERED IN THE ORIGINAL IS 3660 (Part 1) : 1972 (NOW DESIGNATED AS Part 51), IS 3660 (Part 2) : 1968 (NOW DESIGNATED AS Part 52), IS 3660 (Part 3) : 1971 (SINCE WITHDRAWN ON ITS COMPLETE REVISION), AND IS 3660 (Part 4) : 1979 (NOW DESIGNATED AS Part 54) WITH THE NEW REVISED STANDARDS

Test Method	*IS No.*	*Original Part (Series)*	*IS No.*	*New Parts Series*	*Remarks/ Reaffirmed*
(1)	(2)	(3)	(4)	(5)	(6)
NR Series					
Determination of dirt	3660 : 1972	Part 1 (NR : 1)	3660 (Part 1) : 1985	(NR : 1)	Dec 1995
Determination of volatile matter	3660 : 1972	Part 1 (NR : 2)	3660 (Part 2) : 1985	(NR : 2)	Dec 1995
Determination of ash	3660 : 1972	Part 1 (NR : 3)	3660 (Part 3) : 1988	(NR : 3)	Jan 1995
Determination of total copper	3660 : 1972	Part 1 (NR : 4)	3660 (Part 4) : 1988	(NR : 4)	Jan 1995
Determination of manganese	3660:1972	Part 1 (NR : 5)	3660 (Part 5) : 1989	(NR : 5)	Jan 1995
Determination of iron	3660 : 1972	Part 1 (NR : 6)	Deleted since this test is no longer being done		
Determination of rubber hydrocarbon	3660 : 1972	Part 1 (NR : 7)	3660 (Part 6) : 1988	(NR : 7)	Jan 1995
Determination of viscosity by shearing disk viscometer	3660 : 1972	Part 1 (NR : 8)	3660 (Part 7) : 1988	(NR : 8)	Jan 1995
Mixing and vulcanizing in a standard compound	3660 : 1972	Part 1 (NR : 9)	3660 (Part 8) :	(NR : 8)	*under revision*

Test Method	*IS No.*	*Original Part (Series)*	*IS No.*	*New Parts Series*	*Remarks/ Reaffirmed*
(1)	(2)	(3)	(4)	(5)	(6)
Determination of solvent extract	3660 : 1968	Part 2 (NR : 10)	3660 (Part 9) : 1989	(NR : 10)	Jan 1995
Determination of nitrogen	3660 : 1968	Part 2 (NR : 11)	3660 (Part 10)	(NR : 11)	*under revision*
Determination of plasticity	3660 : 1971	Part 3 (NR : 12)	3660 (Part 11) 1989	(NR : 12)	Jan 1995
Determination of plasticity retention index (PRI)	3660 : 1972	Part 3 (NR : 13)	3660 (Part 12) : 1989	(NR : 13)	Jan 1995
Determination of colour	3660 : 1979	Part 4 (NR : 14)	3660 (Part 13) : 1997	(NR : 14)	—
Determination of storage hardening test	3660 : 1979	Part 4(NR : 15)	3660 (Part 14)	(NR : 15)	*under revision*
Determination of volcanization characteristics (MOD test)	3660 : 1979	Part 4 (NR : 16)	3660 (Part 15)	(NR : 16)	do
Method of preparation of test samples	3660:1972	Part 1 (Clause 3)	Proposed to be included in the first revision of IS 5599:1970		

NOTES

1 Original IS 3660 (Part 1) : 1972 now re-designated as IS 3660 (Part 51) : 1972.

2 Original IS 3660 (Part 2) : 1968 now re-designated as IS 3660 (Part 52) : 1968.

3 Subsequent to its complete revision, IS 3660 (Part 3) : 1971 has since been withdrawn.

4 Original IS 3660 (Part 4) : 1979 now re-designated as IS 3660 (Part 54) : 1979.