भारतीय मानक मसौदा

बॉल पॉइंट पेन रीफिल के लिए स्याही — विशिष्टि

(IS 5805 का दूसरा पुनरीक्षण)

Draft Indian Standard

Ink, Ball Point Pen Refill — Specification

(Second Revision of IS 5805)

ICS 87.080

Printing Inks, Stationery and Allied Products Sectional Committee, CHD 14	**Last date of comments: 10th December 2024**

Printing Inks, Stationery and Allied Products Sectional Committee, CHD 14

FOREWORD

(*Formal clauses will be added later*)

This standard was first published in 1970. In the first revision, additional requirements of relative density, viscosity, particle size, *p*H value and surface tension of the ink and their corresponding methods of test were incorporated. Other existing methods of test were also modified in order to make the standard more practical and implementable. Four colours of the ink for use in ball point pen refills were specified and the title of the standard was suitably modified.

In this second revision, Reference clause and Packing and Marking clause have been updated. Now, the standard has been updated based on the technological advancements that may have taken place since the last publication of the Standard.

The quality of ball point pens, amongst other factors, also depends upon the quality of ink used in the refill. It is expected that this standard will enable the manufacturers of ball point pens (*see* IS 3705 Ball point pen) and (*see* IS 3707 Ball point pen refills) to use an assured quality of the ink.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for Rounding Off Numerical Values (*second revision*)' The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard

Draft Indian Standard

INK, BALL POINT PEN REFILL — SPECIFICATION

(*Second Revision*)

1 SCOPE

This standard prescribes requirements and methods of sampling and test for ink used for ball point pen refills.

2 REFERENCES

The standards listed below 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 agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
IS 1848 (Part 1) : 2018	Writing and printing papers — Specification: Part 1 Account book, azure lead, bond, cream laid and cream wove/printing white/printing coloured/printing offset, printing maplitho, printing white super calendered and typewriting types (*fifth revision*)
IS 3707 : 1984	Specification for refill, ball point pen (*second revision*)
IS 4395 : 1987	Glossary of terms relating to inks and allied industry (*first revision*)
IS 4905 : 2015 ISO 24153 : 2009	Random sampling and randomization procedures (*first revision*)
IS 5717 : 2003 ISO 3507	Laboratory glassware — Pyknometers (*second revision*)

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 4395 shall apply.

4 REQUIREMENTS

4.1 Description

The ink shall be solvent based. It shall be free from undissolved particles of dyestuffs/resins or agglomerates of undispersed pigments, etc. It shall have continuous free-flow properties, smooth writing with bright intensity, nontransferable, free from feathering and penetration in the writing tests.

4.2 Colour

The material shall be in four colours, namely, blue, red, black and green.

4.3 Coverage

A quantity of 0.5 ml of the ink, when filled in a refill having a ball point of 1 mm diameter, shall write a line not less than 1 500 m in length on bond paper [*see* IS 1848 (Part 1)].

4.4 Smoothness of Writing and Line Continuity

The ink shall pass the test as prescribed in Annex A.

4.5 Starting Characteristics

The ink shall pass the test as prescribed in Annex B.

4.6 Relative Density

The relative density of the ink shall be in the range of 1.00 to 1.20 when tested in accordance with the method prescribed in Annex C.

4.7 Viscosity

Viscosity of the ink shall be in the range of 12 000 cP to 18 000 cP, when tested in accordance with the method prescribed in Annex D.

4.8 Particle Size

The ink shall not have particles coarser than 10 microns, when tested in accordance with the method prescribed in Annex E.

4.9 Drying Time

The ink shall dry within 5 s, when tested in accordance with the method prescribed in Annex F.

4.10 Resistance to Water

The ink shall not be completely removed with water when tested in accordance with the method prescribed in Annex G.

4.11 Resistance to Chemical Bleach

The ink shall retain its legibility when tested in accordance with the method prescribed in Annex H.

4.12 Resistance to Light

The ink shall not show an appreciable fading when tested in accordance with the method prescribed in Annex J.

4.13 *p*H Value

The ink shall have *p*H value between 6.0 to 6.5 when tested in accordance with the method prescribed in Annex K.

4.14 Surface Tension

The surface tension value of the ink shall be between 35 to 40 dynes/cm when tested in accordance with the method prescribed in Annex L

4.15 Non-transferability

The ink shall not be legibly transferred when tested as prescribed in Annex M.

4.16 Writing Capability on Greasy Surface

The ink shall be capable of writing legibly on greasy surface when tested in accordance with the method prescribed in Annex N.

4.17 Feathering and Penetration

The ink shall pass the test prescribed in Annex P.

4.18 Accelerated Ageing Test

The ink shall pass the test prescribed in Annex Q.

5 KEEPING QUALITY

The ink shall be in working condition for at least two years from the date of manufacture, when stored under normal conditions. It shall satisfy the requirements as prescribed in **4.1** to **4.9** and **4.13** to **4.17**.

6 PACKING AND MARKING

6.1 Packing

The ink shall be packed in tin-plate containers polyethylene carboys or as agreed to between the purchaser and the supplier.

6.2 Marking

The containers shall be marked with the following information:

a) Name and colour of the material;
b) Indication of the source of manufacture;
c) Net mass of the material;
d) Month and year of manufacture; and
e) Batch number in code or otherwise.

6.2.1 *BIS Certification Marking*

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act,* 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

7 SAMPLING

The method of sampling and criteria for conformity of the material shall be as prescribed in Annex R.

8 TEST METHODS

8.1 The test for the requirements prescribed in **4.1** to **4.18** shall be performed in accordance with the methods prescribed in the relevant annexes (from A to R) to this standard.

8.2 For performing the tests, 0.3 g of the ink shall be filled in a plastic refill (*see* IS 3707) having ball diameter of 1 mm. The refill shall be subjected to centrifuge in order to remove air bubbles.

ANNEX A

(*Clause* 4.4)

TEST FOR SMOOTHNESS AND LINE CONTINUITY

A-1 PROCEDURE

A-1.1 Write down on a sheet of white super calendared printing paper or cream-wove paper [*see* IS 1848 (part 1)] numerous fast turns, ovals, angles, reversals, figure 8's continuity, etc., with refill sample made (*see* **8.2**). The refill shall be held at an inclination of 40° to 60°and temperature shall be (27 ± 2) °C while writing.

A-1.2 The ink shall write smoothly and easily without drag and excessive pressure. The writing characteristics shall have bright intensity, free from smudginess and penetration, with line continuity. There shall not be excessive deposits of oozing out of ink on the writing tip or paper. The length of writing shall be at least 1 500 m when tested in accordance with the method of test prescribed in IS 3707.

ANNEX B

(*Clause* 4.5)

TEST FOR STARTING CHARACTERISTICS

B-1 PROCEDURE

B-1.1 Rule a vertical line with the refill on a sheet of white super calendared printing paper or cream-wove paper [*see* IS 1848 (Part 1)]. The refill shall be kept in a vertical position with writing tip upward for one hour. Thereafter, draw horizontal four lines, starting exactly from the margin with normal writing pressure.

B-1.2 The ink shall satisfy the requirements of the test if the first line starts within 15 mm and subsequent lines shall start immediately from the margin.

ANNEX C

(*Clause* 4.6)

DETERMINATION OF RELATIVE DENSITY

C-1 APPARATUS

C-1.1 Pyknometer (Hubbard Type) — *see* Type 6 of IS 5717.

C-2 PROCEDURE

Clean, dry and weigh the bottle with stopper. Fill with distilled water, introduce the stopper and keep it at (27 ± 2) °C for 30 min. Wipe off all surplus water from the surface with a soft clean dry cloth and weigh again. Empty the bottle, clean and dry it and repeat the operation after filling it with the material.

C-3 Calculation

$$\text{Relative density} = \frac{M_2 - M}{M_1 - M}$$

where,

M_2 = mass in g, of Pyknometer with stopper filled with material;
M_1 = mass in g, of Pyknometer filled with distilled water; and

M = mass in g, of the dry Pyknometer with stopper.

ANNEX D

(*Clause* 4.7)

DETERMINATION OF VISCOSITY

D-1 APPARATUS

D-1.1 Brookfield Viscometer — Model LVT having multi-speed and spindle facilities.

D-2 PROCEDURE

Take about 200 g of the ink sample in 250 ml beaker and bring it to a temperature of (27 ± 2) °C. Take viscometer reading by using suitable spindle and speed so as to have accurate reproducible readings. Minimum three readings should be taken and average of these shall be the viscosity.

ANNEX E

(*Clause* 4.8)

DETERMINATION OF PARTICLE SIZE

E-1 APPARATUS

E-1.1 Hegman Scale — Range 6 to 8 (0 to 25 micrometer).

E-2 PROCEDURE

Put the sample ink (one/two drops) in the deep end of the groove of gauge. Draw the material down the length of groove with a uniform motion using scraper. Immediately read the fineness.

ANNEX F

(*Clause* 4.9)

TEST FOR DRYING TIME

F-1 PROCEDURE

Write five-letter word (capital) on a sheet of cream-wove paper [*see* IS 1848 (Part 1)]. After waiting for five seconds, the writing shall be rubbed lightly with finger.

F-2 The ink shall be considered to have passed the requirement of the test if there is no spreading of the ink on the paper.

ANNEX G

(*Clause* 4.10)

TEST FOR RESISTANCE TO WATER

G-1 PROCEDURE

Write down four, five-letter words (capital) on a sheet of white super calendared printing paper or cream-wove paper [*see* IS 1848 (Part 1)]. Immerse the paper in distilled water for 6 h, at temperature (27 ± 2) °C. Remove, allow the paper to dry and examine the writing matter. The ink shall satisfy the requirement of the test if the writing is legible after the test.

ANNEX H

(*Clause* 4.11)

TEST FOR RESISTANCE TO CHEMICAL BLEACH

H-1 REAGENT

H-1.1 Sodium-Hypochlorite — 1 N, *p*H between 9.5 to 11.0

H-2 PROCEDURE

Write down four, five-letter words (capital) on a sheet of cream-wove paper [*see* IS 1848 (Part 1)] apply the above solution with a glass rod to the written words, rubbing the writing gently. Blot after five seconds to remove the excess of solution. Repeat the application of solution again after ten seconds and examine the writing matter for its legibility. It shall be legible.

ANNEX J

(*Clause* 4.12)

TEST FOR RESISTANCE TO LIGHT

J-1 APPARATUS

J-1.1 Ultra-Violet Lamp — 125 W, 125 V, long wave region — 3 655 Å.

J-2 PROCEDURE

J-2.1 Draw 20 parallel lines approximately 150 mm long and 6 mm apart across the narrow dimension on cream-wove paper [*see* IS 1848 (Part 1)]. The lines shall be continuous and of uniform intensity. Expose the sheet to the radiation of an ultra-violet lamp instrument at a distance of 25 cm from the lamp for 24 h.

J-2.2 The ink shall be considered to have passed the test if it shows no appreciable fading when compared with unexposed matter.

ANNEX K

(*Clause* 4.13)

DETERMINATION OF *p*H VALUE

K-1 PROCEDURE

Weigh about 5 g of the ink and extract with hot distilled water. Cool it to room temperature and filter. Determine the *p*H of the filtrate at (27 ± 2) °C by suitable *p*H meter.

ANNEX L

(*Clause* 4.14)

DETERMINATION OF SURFACE TENSION

L-1 APPARATUS

L-1.1 Tensiometer — Torsion wire type.

L-2 PROCEDURE

Weigh accurately 1 g of the sample ink and disperse it in 100 ml hot distilled water. Filter and collect quantitatively the aqueous layer in 1 000 ml volumetric flask. Repeat the extraction of ink with hot distilled water at least three times. Make up the volume to one liter at (27 ± 2) °C. Determine the surface tension of the aqueous layer by means of Tensiometer.

ANNEX M

(*Clause* 4.15)

TEST FOR NON-TRANSFERABILITY

M-1 PROCEDURE

Write several words on one-half of a sheet of cream laid or cream-wove paper [*see* IS 1848 (Part 1)]. Approximately 5 s after writing, immerse half of the paper containing the writing in distilled water for approximately 5 s. Remove and fold in such a manner that the writing shall be in contact with the dry half of the paper. Rub gently several times over the writing, then unfold the paper and examine. The ink shall be considered to have passed the test if there is no legible transfer of the impressions on the other half of the paper.

ANNEX N

(*Clause* 4.16)

TEST FOR WRITING ON GREASE

N-1 PROCEDURE

N-1.1 Apply paraffin oil of viscosity not less than 65 centistokes in a thin film to make stripe of 5 cm width on a 20 cm sheet of paper. Place the oil stripe over a piece of blotting paper 7.5 cm × 25 cm, supported by a smooth level block of wood, approximately 7.5 cm × 25 cm and 2.0 cm thick.

N-1.1.1 Place a second piece of the blotting paper on the other side of the oil stripe and cover with a second smooth level block of wood of approximately the same size and place a 2 kg weight on the center of the top block of wood. Allow the treated paper to remain between the weighed blotting paper for not less than 15 min. Then remove treated paper and repeat the blotting process with unused blotting paper for not less than 15 min more. Remove the treated paper, place on a pad of untreated paper containing not less than 50 sheets and perform the writing test prescribed in **N-1.1.2.**

N-1.1.2 Write down through the oil-treated stripe on the treated paper starting from left to right through the 5 cm wide stripe. Write the equivalent of six five-letter words through the oil stripe six times. The ink shall be considered to have satisfied the requirements of the test if the writing from beginning to end of each line shows the ink to be legible in at least four continuous lines.

ANNEX P

(*Clause* 4.17)

FEATHERING AND PENETRATION

P-1 PROCEDURE

Write down six five-letter words with the ink under test filled in a refill as prescribed in **8.2** on a sheet of cream laid or cream-wove paper [*see* IS 1848 (Part 1)]. After 48 h examine the sheet. The ink shall be considered to have passed the test if there is no feathering or spreading or penetration to the reverse side of the paper.

ANNEX Q

(*Clause* 4.18)

ACCELERATED AGEING TEST

Q-1 PROCEDURE

The refill filled with ink (*see* **8.2**) shall be kept in a vertical position with writing tip downward to each of the following conditions:

Exposure	*Time in Hours*	*Temperature*
I	48	(60 ± 1) °C
II	24	(–2 ± 1) °C

At the end of the test, keep the refills at (27 ± 2) °C for 3 h, and thereafter test the refills for writing test in accordance with the method: prescribed in Annex A.

ANNEX R

(*Clause* 7)

SAMPLING OF BALL POINT PEN INK AND CRITERIA FOR CONFORMITY

R-1 GENERAL REQUIREMENTS OF SAMPLING

R-1.1 Representative samples shall be drawn from each of the selected ink containers. For this purpose, the content of these containers shall be thoroughly mixed by suitable means.

R-1.2 Samples shall be placed in clean and dry bottles and shall be well protected from all possible modes of contamination.

R-1.3 Each sample container shall be sealed air-tight after filling and marked with full details of sampling.

R-2 SCALE OF SAMPLING

R-2.1 Lot

In a consignment all the containers of the same capacity, containing ink of the same colour and belonging to a single batch of manufacture shall constitute a lot.

R-2.2 For ascertaining the conformity of the ink to the requirements of this specification, samples shall be tested for each lot separately. The number of containers to be selected at random from the lot depends on the size of the lot and shall be as given in Table 1.

Table 1 Number of Ink Containers to be selected in the Sample

(*Clause* R-2.2)

SI No.	Lot Size	No. of Containers in the Scale
	(N)	*(n)*
(1)	(2)	(3)

i)	Up to 10	3
ii)	11 to 25	4
iii)	26 to 50	5
iv)	51 and above	6

R-2.3 In order to ensure randomness of selection of the ink containers, random number tables shall be used. For guidance in random selection procedures IS 4905 used.

R-3 PREPARATION OF TEST SAMPLES SAMPLING AND NUMBER OF TESTS

R-3.1 From each of the selected ink containers, about 100 ml ink shall be withdrawn and transferred to sample bottles. When taking sample from large containers, the ink may preferably be withdrawn from different depths of the container using suitable sampling instrument and these portions may then be mixed to form a representative sample of the container.

R-3.2 Number of Tests

Tests for all the characteristics shall be conducted on individual samples. Since the quality of the ink is decided ultimately by using it in a ball-point pen refill, sufficient number of refills shall be tested for each sample as given below.

R-3.2.1 For smoothness and line continuity (**4.4**), starting characteristics (**4.5**), drying time (**4.9**) and non-transferability, five refills shall be taken for each of the individual samples and each one of these refills shall be tested for these characteristics. A sample shall be considered to have failed if two or more of the refills corresponding to that sample do not pass in any one or more of the four different tests as prescribed above.

R-3.2.2 For all the other characteristics prescribed in **4**, two refills shall be tested for each of the individual samples. A sample shall be considered to have passed if both the refills satisfy the requirements for these characteristics.

R-4 CRITERION FOR CONFORMITY OF LOT

The lot shall be considered to be acceptable according to the requirements of this specification if all the samples pass the different tests under **R-3.2.1** and **R-3.2.2**.