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भारतीय मानक मसौदा
सिंथेटिक ग्राइंडिंग फ्लुइड - विशिष्ट
(IS 11186 का पहला पुनरीक्षण)

Draft Indian Standard
SPECIFICATION FOR SYNTHETIC GRINDING FLUID
(First Revision of IS 11186)

(ICS 43.060.30; 75.100)

Lubricants and related Products Sectional Committee,
PCD 25

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FOREWORD

(Formal Clauses will be added later).

This specification covers synthetic coolants for all grinding operations for iron, steel, chromium steel, etc. This is a non-staining type fluid and normally used after dilution with water.

This standard was first published in 1985. This first revision has been brought out to keep pace with the latest technological developments and international practices. In this revision, the following requirements have been added in Table 1:

- Appearance of concentrate;
- Appearance of emulsion; and
- Kinematic viscosity at 20 °C.

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 revised (*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.

1 SCOPE

This standard prescribes the requirements and methods of sampling and test for synthetic grinding fluids.

2 REFERENCES

The following Indian 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 the standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	Title
IS 210 : 2009	Grey iron castings — Specification (<i>fifth revision</i>)
IS 460 (Part 1): 2020	Test Sieves — Specification Part 1 Wire Cloth Test Sieves

	<i>(fourth revision)</i>
IS 1070 : 2023	Reagent Grade Water Specification <i>(fourth revision)</i>
IS 1447 Part 1: 2021	Methods of Sampling of Petroleum and its Products Part 1 Manual Sampling <i>(second revision)</i>
IS 1448	Methods of test for petroleum and its products
(Part 25/ Sec 1): 2018/ISO 3104 : 1994	Transparent and opaque liquids Section 1 Determination of kinematic viscosity and calculation of dynamic viscosity <i>(second revision)</i>
(Part 32) : 2019 / ISO 3838 : 2004	Crude petroleum and liquid or solid petroleum products — Determination of density or relative density - Capillary stoppered pyknometer and graduated bicapillary pyknometer methods <i>(third revision)</i>
(Part 40) : 2015 / ISO 3733 : 1999	Petroleum products and bituminous materials — Determination of water - Distillation method <i>(fourth revision)</i>
(Part 98) : 1981	Determination of emulsion stability of emulsifiable cutting oils
(Part 99) : 1981	Determination of frothing characteristics of emulsifiable cutting oils
IS 2062 : 2011	Hot rolled medium and high tensile structural steel — Specification <i>(seventh revision)</i>

3 REQUIREMENTS

3.1 General Requirements

3.1.1 The material shall be prepared from synthetic products, water and chemicals. It shall be free from mineral oils. It shall be dyed to impart colour to the product in order to differentiate it from water.

3.1.2 The material shall be clear transparent, homogeneous liquid, free from dirt and suspended matter.

3.2 Specific Requirements — The material shall comply with the requirements prescribed in Table 1, when tested according to the methods prescribed in col 4 of Table 1.

TABLE 1 REQUIREMENTS FOR SYNTHETIC GRINDING FLUID
(Clause 3.2 and 4.1)

Sl No.	Characteristic	Requirements	Method of Test
(1)	(2)	(3)	(4)
i)	Colour	To Report	Visual
ii)	Appearance of concentrate	To Report	Visual
iii)	Appearance of emulsion	To Report	Visual by Annex A
iv)	Specific gravity at 15.6 °C	To Report	IS 1448 (Part 32)
v)	Kinematic Viscosity at 20 °C, mm ² /s	To Report	IS 1448 (Part 25/Sec 1)
vi)	Water content, percent by mass, <i>Min</i>	40	IS 1448 (Part 40)
vii)	pH of 2 percent solution with distilled water, <i>Min</i>	9.0	pH meter
viii)	Cast iron corrosion test, 50 : 1 ratio emulsion / solution with distilled water, <i>Max</i>	0 / 0-0	Annex B

ix)	Frothing test, 50 : 1 ratio with distilled water	No frothing after 15 min	IS 1448 (Part 99)
x)	Dilution test	Shall pass the test	Annex C

4 KEEPING PROPERTIES

4.1 The material when stored in original sealed containers under ambient temperature conditions in shade shall retain the properties described in Table 1 for a period of not less than 6 months from the date of manufacturing.

5 PACKING AND MARKING

5.1 Packing — The material shall be packed in securely closed metal drums or any other suitable containers of appropriate size and strength as agreed to between the purchaser and the supplier.

5.2 Marking — Each container shall be marked with the following information:

- a) Name of the material;
- b) Manufacturer's name, address and recognized trade mark, if any;
- c) Net mass/volume of material in the container;
- d) Identification in code or otherwise to enable the lot to be traced back from records;
- e) Date or year of manufacture/packing; and
- f) Any other statutory requirements.

5.2.1 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.

6 SAMPLING

6.1 Representative sample of the material and preparation of composite sample shall be as prescribed in IS 1447 (Part 1).

6.2 Number of Tests and Criteria for Conformity

6.2.1 All the requirements prescribed in the specification shall be tested on the composite sample.

6.2.2 The lot shall be declared as conforming to the specification if all the test results of the composite sample meet the relevant specification requirements.

ANNEX A

[Table 1, Sl No. (ii)]

APPEARANCE TEST

A-1 PROCEDURE

A-1.1 Place 90 ml of distilled water (*see* IS 1070) in 100 ml graduated stoppered measuring cylinder and add 10 ml of the material at ambient temperature. Mix the mixture for 5 min by shaking. Report the visual appearance.

ANNEX B

[Table 1, Sl No. (viii)]

CAST IRON CORROSION TEST

B-1 SCOPE

Cutting oils which are used in the form of aqueous dispersions or solutions should not readily permit corrosion of equipment with which they come into contact. This method is accordingly designed to assess the behaviour of such fluids in contact with a typical metal, such as cast iron; and is applicable to samples submitted either in the form of an aqueous fluid as used in practice or as a concentrate requiring dilution with water.

B-2 OUTLINE OF THE METHOD

Steel millings are placed on the cleaned surface of a cast-iron plate and emulsion of the cutting oil under test is poured on to them. After 24 h the millings are removed and the surface of the plate is examined for corrosion.

B-3 APPARATUS

B-3.1 Test Plate — Conforming to Grade 25 of IS 210; 10 cm × 10 cm × 6 mm (originally) of grey cast iron, the surface being ground to a smooth finish free from chatter marks and furnishings, CLA 0.25 µm to 3.38 µm.

B-3.2 Steel Millings — Approximately 6 mm long and 1.5 mm to 3 mm width prepared by dry-milling the steel conforming to IS 2062.

B-3.3 Test Chamber — A suitable chamber may be used which shall be capable of maintaining a temperature of (27 ± 2) °C and humidity at (52 ± 5) percent. The required level of humidity may be obtained by placing at the bottom of the cabinet at least one open dish, not less than 15 mm diameter, containing a saturated solution of sodium bisulphate in contact with an excess of solid bisulphate which gives a humidity of 52 percent at 20 °C. Lumps of solid bisulphate should stand out of the liquid. If a large chamber is used with several plates under test, several dishes may be desirable. Alternatively, separate chambers, each with a dish of bisulphate, can be used one for each test plate.

B-3.4 Pipette — Calibrated to deliver 2 ml of the fluid.

B-4 PREPARATION OF SAMPLE

For carrying out this test the 20 : 1 ratio emulsion shall be prepared with 400 ppm hard water [*see* IS 1448 (Part 98)].

B-5 PREPARATION OF APPARATUS

B-5.1 If the surface of any plate is corroded or pitted, grind the plate to a smooth surface. Do not allow the plate to become burnished.

B-5.2 If the thickness of the plate is reduced to 3 mm, discard it.

B-5.3 Immediately prior to test, prepare the ground surface of the test plate as follows and do not touch the surface subsequently. Carry out this procedure irrespective of whether or not the plate has been used before, and whether or not it is new or reground:

- a) Wipe with cotton wool soaked in toluene;
- b) Wash with acetone from a wash-bottle;
- c) Wipe dry with cotton wool;
- d) Rub the plate on a new piece of No. 0 emery cloth placed on a flat surface (for example plate glass), rubbing heavily by hand for 30 double-strokes without lifting in each of two direction at right angles. A hand magnet may be found convenient to hold the plate for this operation. If stain marks are still apparent, treat the plate as pitted and regrind it;
- e) Wipe with clean filter paper soaked in acetone; and
- f) Rub with successive pieces of dry clean filter paper until no marks are apparent on the paper.

B-6 PROCEDURE

B-6.1 Make the test in a room free from corrosive fumes.

B-6.2 Take the millings and sieve with a standard 710-micron IS sieve [see IS 460 (Part 1)]. Discard the dust and retain the millings. Discard all the millings if any rust is present.

B-6.3 Wash the millings in acetone and allow to dry in air. Thereafter, the millings should remain untouched by hand.

B-6.4 With the aid of a spatula, place 4 portions each of approximately 2 g of steel millings in a single layer each centrally in a quarter of the prepared surface of the plate. Each portion shall be so disposed that the edges are not in contact either with adjacent portions or the edges of the plate.

B-6.5 Pipette the fluid to be tested on each portion of millings, so that the millings are thoroughly wetted. The fluids on adjacent portions shall not run together. About 2 ml of the fluid will be required per portion of millings. If testing several fluids at once, put the 4 portions on different plates as far as possible, so that each plate has several fluids on it. This minimizes error due to possible variations in plates.

B-6.6 Transfer the plate to the test chamber, the temperature and humidity of which is maintained as specified in **B-3.3**.

B-6.7 After 24 h, remove the plate from the cabinet, remove the millings from the plate and discard them. Wash the surface of the plate with acetone then with toluene and finally rub gently with a filter paper soaked in toluene.

B-6.8 Inspect the surface areas of the plate for corrosion, and record pittings and staining results separately for each test area, for example, the areas previously covered by 2 g of steel millings as follows:

B-6.8.1 *Pitting* — Record the number of pits present.

B-6.8.2 *Staining* — Record the extent and intensity of staining using the following numbers:

<i>Number</i>	<i>Proportions of Test Area Stained</i>	<i>Number</i>	<i>Intensity of Staining</i>
0	Nil	0	Nil
1	Less than 10 percent	1	Hardly perceptible

2	From 10 percent to less than 25 percent	2	Slight staining
3	From 25 percent to less than 50 percent	3	Heavy staining
4	From 50 percent to less than 75 percent	4	Surface damage (not including pits)
5	75 percent and above		

If staining is not uniform record the maximum intensity observed.

B-7 REPORTING

B-7.1 Report the results by three numbers, the first being the number of pits, followed by an oblique stroke; the second, the area of staining followed by a hyphen; and the third, the maximum intensity of staining (for example: 0/1-1, 6/0-0, 0/3-2, etc).

B-7.1.1 Also report relevant test details, as follows:

- a) Nature of added water used; and
- b) Dilution if known and method of preparation, if relevant.

B-8 PRECISION

B-8.1 The precision cannot be expressed in a useful form to cover all cases. Extensive investigations have shown that it is very poor when the corrosion probability is of the order of 50 percent, but that it is better when either very little or considerable corrosion occurs. The use of statistically designed programmes are recommended whenever comparative tests are to be made.

ANNEX C

[Table 1, Sl No. (x)]

DILUTION TEST

C-1 PROCEDURE

Place 90 ml of distilled water (*see* IS 1070) in 100 ml graduated stoppered measuring cylinder and add 10 ml of the material at ambient temperature. Mix the mixture for 5 min by shaking and leave it for 24 h undisturbed. It shall remain clear and fluorescent after 24 h. A trace of cream and dye separation is permitted.